The Veterinary Record

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 23. JUNE 4, 1938 VOL. 50.

Entozon and Acriflavine for the Treatment of Chronic, Contagious Bovine Mastitis*

A. W. STABLEFORTH AND N. J. SCORGIE,

DIVISION OF PREVENTIVE MEDICINE, ROYAL VETERINARY COLLEGE AND HOSPITAL, LONDON

The purpose of this article is to report experiments on the value of infusion with entozon or acriflavine as a means of sterilizing the udders of cows infected with the common mastitis streptococcus, *Str. agalactiae*, particularly with a view to its use as an adjunct to control of the disease by separation of infected and non-infected cows.

The observations on entozon were made by A.W.S., those on acriflavine by N.J.S. The methods used and the type of case treated were in general similar. The results are, however, not strictly comparable because these two agents were used in different herds and, in particular, because the infections treated with acriflavine were known to be in most cases of fairly recent origin.

Numerous investigators in this and other countries have drawn attention to the widespread occurrence of the chronic, contagious form of bovine mastitis caused by *Str. agalactiae*. Seelemann (1932), for example, found infection in 33 per cent. of 7,691 cows belonging to 173 herds in Germany, and Rosell (1933) in 34·2 per cent. of 1,222 cows in the province of Quebec, whilst Minett (1934), referring to the observations carried out in this country, reported that 38·3 per cent. of 2,530 cows in 48 herds were infected, the incidence in the various herds varying from 10 to 71 per cent. Similar figures have been reported in certain other countries. The incidence of the disease is at its highest in dairy herds and, as pointed out by Pröscholdt (1928), particularly in large herds. Figures obtained in this department in recent years have been similar to those reported by Minett.

Whilst the loss caused by clinical cases, particularly in an outbreak involving a number of cows such as sometimes occurs, is obvious, it is difficult to estimate the economic loss as a whole. Several factors are involved, of which the most important are (1) interference with the normal milk yield which necessitates the keeping of extra cows; (2) increased herd wastage; (3) lowered quality of the milk. With regard to quantity, it has been recently shown by Minett and Martin (1936) by a statistical examination of the records of equal numbers of infected and non-infected cows in three herds, totalling 373 lactations, that the percentage loss of expected milk yield due to mastitis was 10·8 per cent. in a herd of Ayrshires and 16·5 per cent. and 19·5 per cent. respectively in Friesians belonging to two herds. It is important, moreover, to note that in these herds the mastitis was predominantly of the ordinary contagious type, largely subclinical, and there was nothing in the nature of an acute outbreak which would make the reduction in yield unusually great.

Attempts to control *Str. agalactiae* mastitis have mainly been made by vaccination, by separation of infected and non-infected cows or chemotherapy. The results of controlled vaccination experiments have shown that the disease cannot be eradicated or even satisfactorily reduced by this means.

For data, reference may be made to reports by Jones (1930), Plastridge, Anderson, White and Rettger (1934), Hucker and Hansen (1937) all in the U.S.A.; Diernhofer (1929) in Austria; Seelemann (1932) in Germany; Steck (1934, 1), Steck, Gygax and Dachis (1936) in Switzerland. Results obtained in herds in which no controls are kept are of little value because, as shown by Steck (1934, 1) and earlier, the severity of the clinical symptoms and natural rate of spread may very considerably, even from year to year in the same herd.

It has been shown, on the other hand, that the disease can be eradicated or controlled by the segregation of infected cows on the basis of cultural examination of milk samples.

Minett, Stableforth and Edwards (1933) reported on a herd freed by this means. Stableforth, Edwards and Minett (1935) reported on six other herds: one had been free for three years, one was built up from heifers and was free, and in three others the incidence had steadily fallen, whilst in another, after a rise, the incidence had also fallen regularly. Plastridge, Anderson, Weirether and Johnson (1936) reported somewhat similar results, *viz.*, eradication in one herd, prevention of infection in another built up from heifers, and gradual reduction in five others.

*Presented to a meeting of the Sussex Division, N.V.M.A., at Brighton, February 4th, 1938.

Eradication of the disease by these measures is, however, made difficult by the fact that the owner may wish to retain many of the infected cows, which are a potential source of infection, for a considerable time. Any method by which the infected udders can be sterilized without undue interference with milk secretion is therefore of obvious value.

Numerous attempts have been made to sterilize udder infections, and the following routes have been used: oral, blood stream, so-called "parenchymatous" and the teat canal. The so-called "parenchymatous" route may be at once dismissed because its action is likely to be limited to the locality into which the needle strikes and because wounds have to be made through the skin. Treatment by way of the blood stream or mouth has so far not proved practicable owing to the difficulty in obtaining a bactericidal concentration in the udder without coincident toxic effects on the animal. We are investigating the possibility of using sulphanilamide for this purpose but the evidence as yet available is insufficient. The only method which has so far proved of value is infusion *via* the teat canal. By this route, the bactericidal solution is brought into close contact with the greater part or whole of the affected areas.

By 1925, it was recognised that simple antiseptics, such as salts of the heavy metals, phenols, cresols, formalin, etc., were too irritant to be used. In 1923, however, Bugge reported good results with rivanol, a complex, organic compound with high antiseptic but low irritant properties, and in 1925, Schnorf, after comparing a number of other acridine derivatives, advocated "Uberasan." Rivanol and "Uberasan" fell into some disfavour again until Steck (1931) emphasised their value, being followed quickly by Götze (1931) and Seelemann (1932). Hucker and Lee (1932) found crystal violet, brilliant green and acriflavine of no value, whilst they obtained promising results with azamine. Gildow, Hansen and Cherrington (1933) reported that ultra violet light, colloidal carbon, formalin (and also autogenous vaccines) were of no value. Seelemann and Siemonsen (1933) compared various preparations, *viz.*, rivanol, entozon, parenchymatol J, uberasan, oxychinol, selectan, azamine, sulphurous acid and boric acid, and concluded that the acridine derivatives, entozon and rivanol, were definitely superior to the others because of their high bactericidal reaction on streptococci and their comparatively low irritant effect on the tissues. Following these observations, further reports on entozon, usually favourable, appeared from various German sources, of which the papers by Seelemann (1933), Seelemann and Hadenfeldt (1933), Trautwein, Weisshaupt and Wagener (1934), and Gerke (1935) should be mentioned.

Meanwhile Steck, who had continued to work on this problem consistently since 1929, reported (1934, 2) that in a comparison of the relative efficiency of uberasan, rivanol, entozon and trypaflavine, he found that at concentrations of equal irritant action on the udder, trypaflavine had the highest bactericidal action in normal or slightly altered secretions, whilst entozon excelled in pus-like secretions. Further (1934, 3) he reported that the effectiveness of trypaflavine was increased by the use of ten times more concentrated solution for the last 400 c.c. of the injection and (1936, 1, 2, 3 and 1937) that the irritant effect of this more concentrated injection may be reduced by making it up in 20 per cent. saccharose without decreasing its effectiveness and that equally good results are obtained by infusing a small quantity of solution. Kästli (1937) gives results showing the effectiveness of the above method in a large number of herds. Reference to Steck's numerous and valuable contributions on the subject will be found in his 1937 report.

GENERAL PLAN OF INVESTIGATION

From an examination of the literature up to the time when the work commenced, it was decided to test the effect of entozon and acriflavine* given *via* the teat canal.

Observations on entozon were made in two herds, in both of which cultural examination of the milk was being made at three-monthly intervals. Those on acriflavine were made in a herd in which examinations were being carried out at first at three-monthly intervals, but later once a month. Milk examinations from all lactating cows and heifers were carried out in blood agar plates in the manner described by Minett, Stableforth and Edwards (1930) using the selective medium described by Edwards (1930, 1933). The streptococci were identified serologically (Stableforth 1932, 1937).

In the case of entozon most of the cows were treated shortly after the original herd examination so that the age of the infection was not known; many were of long-standing. In the case of acriflavine, however, it was possible to secure cases for treatment during the early stages of the disease and before any appreciable alteration of the udder had occurred, whilst the age of the infection was usually known fairly exactly.

The general method of procedure was to make the injections on the day following the weekly milk recording, and immediately before injecting to take samples of milk from each quarter in order to have the data from these in addition to those obtained from previous examinations. Animals in milk were given what will be referred to as a "short" injection, that is to say, the solution was left in the udder for five to six minutes (sometimes ten minutes in the case of clinical cases of mastitis). The second injection was given a week later, and after a further seven days, samples were again taken for examination.

In the case of dry cows, the injection was left in for 24 hours and in the case of entozon this treatment was repeated at the end of one week. The examination was in some cases made seven days later but in most cases was postponed until one week after the next

*Trypaflavine cannot be imported because acriflavine, which is stated to be exactly similar, is made in Great Britain.

calving. A small number of quarters in which the "short" treatment had failed were also treated by the 24-hour method. Data were kept at the farm regarding the clinical effects of the injection.

The cases treated are classified as latent infections or clinical infections. By latent infection should be understood a sub-acute or chronic state of the disease existing without obvious symptoms or in which occasional clots are seen in the fore milk from time to time. In about half of these cases, the milk samples showed the usual evidence of early mastitis, that is to say an increase in the cell content as judged by the amount of deposit after centrifuging. This varied from 1 to 50 parts per 1,000, being in general not more than about two or three parts per 1,000.

Clinical mastitis may be defined as including those cases in which there was marked evidence of udder disturbance, *viz.*, regularly clotted milk or chronic induration or in which, whilst most of the secretion was usually normal, clots were frequently found, particularly in the fore milk. Some of these cows had also shown a steep drop in milk yield and the shortening of lactation sometimes met with in affected cows. Treatment of the few cases which showed acute symptoms was postponed until this phase had passed.

Technique of the Infusion

The solution for injection was made up in distilled water;* it was injected into the affected quarter under low pressure from a hand bellows or pump of a type similar to that used for the inflation of the udder in milk fever. The apparatus used is shown in fig. 1. A is a glass flask, carrying a side arm E, designed to hold approximately 6 litres of solution. The flask is fitted with a rubber stopper, through which passes a metal tube B. To the metal tube is attached a length of rubber tubing C, which carries a metal adapter D, fitted with one, two or four taps and teat syphons. To the side arm E (of the flask) is attached the bellows. When air is pumped

*Tap water may be used provided it is boiled before use and, if hard, allowed to sediment overnight.

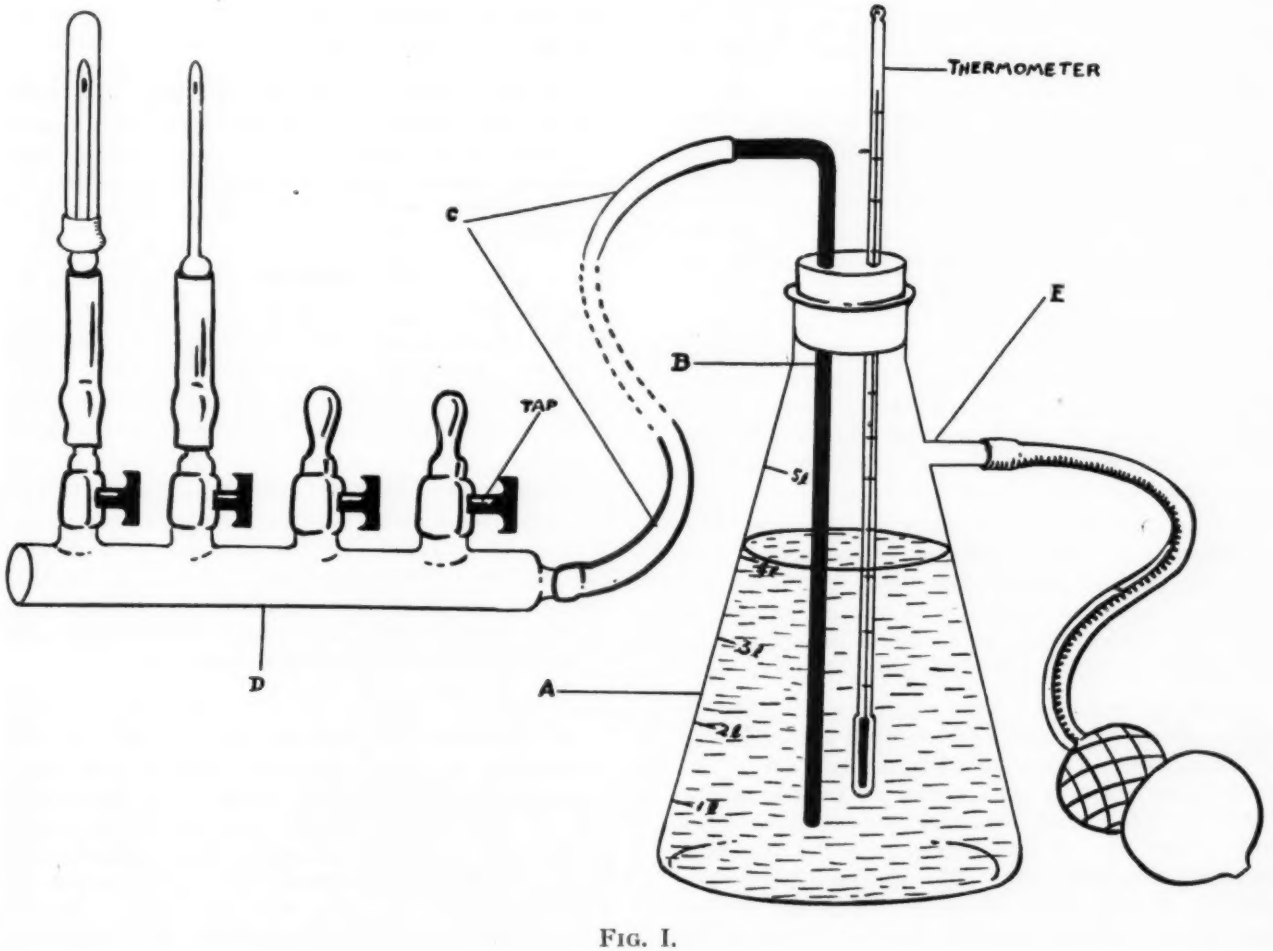


Fig. I.

into the flask, the solution is forced through B and C into the quarters of the udder *via* the metal adapter and the teat syphons. When in use the flask is kept in a bucket of warm water which helps in keeping the solution at body heat and prevents a breakage if the cow moves unexpectedly.

Injection of the solution was carried out at blood heat, the quarter being filled to the tension normally present at milking time. The teat syphons when not in the udder were kept immersed in strong entozon or acriflavine by pushing each into a test tube containing the solution and fitted with a rubber cap. They could thus be laid on the floor if required. The actual technique is as follows:—

(1) The udder is washed with water and dried.

(2) All quarters to be injected are stripped thoroughly.

(3) One or more teat syphons, according to the number of quarters being treated, are carefully inserted into the teat-ducts.

(4) The teat-duct and milk sinus are washed out with a preliminary injection of 100 to 200 c.c. of solution, massage being applied during injection, and then immediately stripped out. The object of thus washing out the quarter is to remove as much milk as possible.

(5) The teat syphons are re-inserted and the quarter filled to that tension which would normally be present at milking time. The solution is left there for five to six minutes (up to ten minutes for clinical cases) or for 24 hours, depending on whether the cow is in milk or dry.

(6) During and after the injection, but before stripping, the quarter is lightly kneaded and massaged. If the four quarters are injected in succession, with a single syphon, then stripping of each quarter is commenced five to six minutes or ten minutes, as the case may be, after the injection began.

(7) In the case of "short" injections, the quarters are then stripped thoroughly and stripped again twice that day. They are stripped three or four times on the following day. In the case of the 24-hour injection, the cow is not stripped out until the following day.

Quantity Injected.—The quantity of solution injected varied in accordance with the capacity of the udder, from approximately 500 to at most 1,500 c.c. It was usual to reckon about 1,000 c.c. for each quarter to be injected—100 to 200 c.c. of this being used for the preliminary washing out. The quarter was completely filled, but without causing undue distension. When three or four quarters were treated, the volume of solution injected was usually somewhat reduced.

Duration of the Injection.—Whilst it is possible to state that the injection was made and that the quarter was stripped out five or ten minutes respectively afterwards, this statement unfortunately does not give much real indication of the time during which some, at least, of the solution was in contact with the tissues, because it is well known that when, say, 1,000 c.c. are injected and an attempt made to strip it out at once, not more than 400 to 500 c.c. will be recovered, and that if stripping is delayed for a few minutes longer, the quantity which can be stripped out will probably be not more than 200 to 300 c.c. In practice, however, there is no doubt that if the injection is left in for eight to ten minutes, the reaction is very much more severe than if it is stripped out after five to six minutes. The largest syphons practicable were used in order to facilitate rapid injection. The apparatus figured was adopted because by this means the necessary volume of solution can be injected much more quickly than when it is allowed to flow in by gravity in the way adopted by all previous workers. The four-way teat adapter was introduced for the same reason but was found to be rather cumbersome, and a two-way adapter is recommended. In practice, from 18 to 30 quarters (average 24) were treated in about three hours. The actual injection took one to two minutes per quarter (slightly longer in cows with small teats) with the single syphon, whilst with a four-way attachment, four quarters could be injected in three to four minutes.

Entozon

Both latent and clinical cases were treated with entozon and both the "short" and the 24-hour methods of treatment were used. Details of milk yield were also obtained weekly from one herd and are reproduced in Table 6.

Method of Working and Strength of the Solution.—The method used was as described earlier, the solution being used at a concentration of 1 : 1,250. In practice the entozon was put up in tubes containing 10 c.c. of 1 : 12·5 solution, so that the addition of one tube to every litre of distilled water would give the required concentration for injection.

Results.

In Table 1 are given the results of the treatment of nine quarters which had been experimentally infected with *Str. agalactiae* one to two months before and which had since that time regularly excreted very large numbers of these organisms; all were cured by two injections of five minutes each. Six of these quarters were cured by the first injection.

TABLE I
RESULTS OF TREATMENT IN EXPERIMENTALLY INFECTED QUARTERS

Cow.	Age of Infection.	Quarters Treated.	Quarters Cured.	
Nancy 1	2 months	2	2	All cured by one or two injections of five minutes.
Nancy 2	1 month	4	4	
Mayfly	2 months	3	3	

In Table 2 are shown the results of the treatment of 25 cows affected with latent mastitis in 60 quarters. Nine of these cows had shown no symptoms and milk samples were practically without exception normal, that is to say, they showed no excess of cells or abnormal chemical reaction. Twelve quarters of eight cows had shown occasional clots from time to time or a markedly excessive deposit after the milk was centrifuged. Twenty-three quarters of ten cows showed other evidence of early mastitis, that is to say, an abnormal cell content as shown by the deposit of more than one part per 1,000 in the milk after centrifuging. They had had, in most cases, one to four calves with an average of between two and three. Eighteen were treated during lactation, in most cases towards the end, or when actually drying and received the "short" treatment followed, in some cases, by a 24-hour treatment. Seven were dry and six of these received only the 24-hour treatment: the other —No. 964—was treated after the next calving, a fact which accounts for the discrepancy of one in the figures for latent cases.

Special reference should be made to Cow 165 which was treated when dry. The examination of samples from this animal after calving showed no evidence of infection, but the milk from all quarters was clotted and the quarters were somewhat indurated. The treatment of this cow is listed as a failure.

TABLE II
RESULTS OF TREATMENT OF 25 COWS WITH LATENT MASTITIS

Cow.	Symptoms.	No. of Calves.	Stage of Lactation.	Method of Treatment and Number of Quarters.				Totals.		Remarks.
				"Short."		24 hours.				
				Treated.	Cured.	Treated.	Cured.	Treated.	Cured.	
G68	Deps. all	2	Late	4	3	—	—	4	3	
G33	None	1	Late	3	2	—	—	3	2	
132	None	3	Late	3	3	—	—	3	3	
40	None	3	Late	4	4	—	—	4	4	
230	Marked	1	Late	1	1	—	—	1	1	
195	None	2	Late	2	2	—	—	2	2	
325	None	1	Middle	2	2	—	—	2	2	
326	Deps. all	1	Middle	2	2	—	—	2	2	
328	Deps. all	2	1 month	3	3	—	—	3	3	
331	Dep. one	1	Late	2	2	—	—	2	2	
354	Dep.	2	Middle	1	0	—	—	1	0	
332	Large dep.	2	1 month	1	1	—	—	*1	1	
271	Slight	4	Late	4	0	—	—	4	0	
302	None	4	Drying	2	0	—	—	2	0	
117	Clots 1 Dep. 1	3	Late	2	1	1	0	2	1	
G20	None	2	Late	2	1	1	1	2	2	
G87	Slight	3	Drying	2	0	2	1	2	1	
G11	Slight	3	Drying	3	0	3	1	3	1	
964	Deps. two	5	Dry	3	2	4	1	4	3	Treated first when dry
138	Dep. one	2	Dry	—	—	1	1	1	1	
165	Slight	3	Dry	—	—	3	?0	3	?0	Clots all. Indurated after
244	None	1	Dry	—	—	2	2	2	2	
348	Slight	4	Nearly dry	—	—	1	1	1	1	
121	Deps. three	3	Dry	—	—	4	4	4	4	
672	Deps. both	8	Dry	—	—	2	2	2	2	
				46	29	24	14	60	43	

Deps. = Deposit, *e.g.*, Deps. all = Deposit in all four quarters after centrifuging.

In Table 3 are given the results for the ten cows affected with clinical mastitis. In seven of these cows, mastitis had been present during the previous lactation and in two cows all quarters were indurated. In the remaining cases, clots in all quarters were frequent. In five of these cases listed as clinical mastitis the milk had been regarded as unsaleable and was given to calves. The number of lactations varied from two to seven with an average of four. Eight were treated during lactation, usually late, and two whilst dry.

The results given in Tables 2 and 3 are briefly analysed in the summary at the end of the paper.

In Table 4, the summarised results for the experimental infections, cases of latent mastitis and cases of clinical mastitis in terms of quarters are reproduced side by side in order that comparison may be facilitated. It is seen that all of the experimental infections were cured and 71·7 per cent. of the latent cases, but only 35 per cent. of those quarters which had clinical mastitis.

In Table 5 are shown the summarised results in terms of cows. It is seen that all the experimentally infected cows were cured and 60 per cent. of the cows infected with latent mastitis, but that it was only possible to cure completely one out of ten cows affected with clinical mastitis.

In Tables 4 and 5 (*overleaf*), separate columns are given for the cows which had only the 24-hour treatment, and for those which had the 24-hour treatment subsequent to the failure of the "short" treatment.

Period of Observation Subsequent to Treatment.—With one exception, all cows listed as cured remained free as long as they were in the herd, that is to say, for more than one year in most cases; three, however, were sold after four, five and seven months respectively.

TABLE III
RESULTS OF TREATMENT OF 10 COWS WITH CLINICAL MASTITIS

Cows.	Symptoms.	No. of Calves.	Stage of Lactation.	Method of Treatment and Number of Quarters.				Totals.		Remarks.
				"Short."		24 hours.				
				Treated.	Cured.	Treated.	Cured.	Treated.	Cured.	
869	Marked 2 Old case	6	Middle	4	2	—	—	4	2	
790	Marked all Old case	7	Middle	4	0	—	—	4	0	
192	Clots 3 Old case	2	Late	4	4	—	—	4	4	
211	Clots 3	2	Late	4	0	—	—	4	0	
169	Clots all Old case	2	Late	4	2	1	0	4	2	
3	Clots 2 Deps. 2	5	Late	4	0	4	0	4	0	
947	Marked Old case	5	Middle	3	0	3	0	3	0	
123	Clots 2 Old case	3	Late	4	2	2	1	4	3	
309	Clots all Indurated	4	Dry	—	—	3	1	3	1	
275	Clots all	4	Dry	—	—	3	1	3	1	
				31	10	16	3	37	13	

Col. 2. "Marked 2" means marked symptoms in 2 quarters. "Clots 3" means clots in 3 quarters and so on.

TABLE IV
SUMMARY OF RESULTS IN QUARTERS

Nature of Case.	Method of Treatment, Number of Quarters Treated and Result.						Totals.	
	"Short."		24 hours.		"Short" + 24 hours.			
	Treated.	Cured.	Treated.	Cured.	Treated.	Cured.	Treated.	Cured.
Experimental	9	9	—	—	—	—	9	9
Latent	46	29	13	11	11	4	60	43 (71·7)
Clinical	31	10	6	2	10	1	37	13 (35·1)

Table V
Summary of Results in Cows

Nature of Case.	Method of Treatment, Number of Quarters Treated and Result.						Totals.	
	"Short."		24 hours.		"Short" + 24 hours.			
	Treated.	Cured.	Treated.	Cured.	Treated.	Cured.	Treated.	Cured.
Experimental	3	3	—	—	—	—	3	3
Latent	14	9	6	5	5	1	25	15 (60·0)
Clinical	4	1	2	0	4	0	10	1 (10·0)

During this time, several examinations had been made, *viz.*, at seven days after the last treatment, after the next calving in the case of dry cows and at the usual three-monthly herd tests. The one exception was Cow 328 which again showed infection twelve months after treatment, but with a different type. The results in the tables, therefore, refer to a period of freedom of at least four months and in all except three cases, of twelve months or longer. Several quarters were free at the first examination seven days after treatment but showed infection at the next test, whilst two quarters remained free for a period of approximately two months after treatment and then became infected. None of these are included as cured.

Clinical Effects of the Injection.—One or two exceptional cases were met where the cow objected to the actual injection of the solution. Slight uneasiness was shown by some cows a few minutes after the infusion was completed, but this passed off within ten minutes. In most cases, in which the injection was left in for the 24-hour treatment, a definite uneasiness, sometimes of a marked nature with paddling and kicking, was noticed some hours afterwards. In the case of those milking cows in which the injection was left in for more than seven or eight minutes (clinical cases) the udder sometimes became definitely hardened within an hour or so. Clinical symptoms other than alteration of the milk had, however, generally passed off by the following morning.

Up to 24 hours after treatment the secretion usually contained clots. These, however, in general disappeared by the second or at latest third day. The milk was also discoloured for several days but this also had usually disappeared within three or four days, although exceptional cases were met with in which it persisted for nearly a week.

Effects on Milk Yield.—The milk secretion was markedly reduced for two days but usually again reached the normal by the fourth to seventh day. In a few cows some depression of yield remained, whilst in certain others the yield was definitely higher by the seventh day than would have been expected had no treatment been given.

In Table 6 (*overleaf*) are given details of the milk yields for one herd in which weekly recordings were made. They refer to those cows which were injected during lactation and cover a period of six weeks before and after treatment was commenced. The yields were recorded each Wednesday, that is to say, the day before treatment. The small figures in the table indicate the number and time of the injections, and in the last column is shown the time when 24-hour injections were first given. It will be seen that subsequent to treatment the average yields are calculated as though all the seventeen cows were being recorded throughout. Actually an increasing number were no longer recorded and appear therefore in the table as yielding nothing.

Considering the daily yield on the usual milk recording day, it is seen that:—

Three weeks before treatment began 17 cows gave 376 lbs.; average 23½ lbs.

The day before treatment began 17 cows gave 313 lbs.; average 18½ lbs.

Three weeks after treatment began 17 cows gave 218 lbs.; average 13 lbs.,

i.e., the drop in yield during the three weeks subsequent to the beginning of treatment was little greater than the drop which had occurred during the preceding three weeks. This particular period of six weeks is taken for comment because three weeks before treatment commenced all cows were in milk except one (No. 3, which came in at the average) and because three weeks after treatment all cows had received their second injection at least six days previously and only two cows (947 and 117) had then received more than two injections.

A simple comparison of averages in this way is open to certain objections because many factors are concerned, and requires some further comment. On the one hand there are factors which may make the drop in milk yield appear less than it should be. Firstly, Cow No. 3, although coming in at the average yield, had nevertheless recently calved and her yield might therefore have been expected to

TABLE VI
MILK YIELDS BEFORE AND AFTER TREATMENT (ENTOZON)

Cow.	No Quarters Done.	Yield for Weeks before Treatment (lb.).						Yield for Weeks after Treatment Commenced (lb.).						Remarks.
		6	5	4	3	2	1	1	2	3	4	5	6	
123	4	19	19	19	19	19	19[1]	18	18[2]	13[3]	12	13[4]	—	4th injection 24 hours
169	4	22	22	20	20	21	18[1]	16	17[2]	12[3]	10	7[4]	—	4th injection 24 hours
G20	2	17	17	16	16	15	13[1]	7	4[2]	—[3]	—	—	—	3rd injection 24 hours
230	1	17	18	18	18	18	17[1]	14	12[2]	8	6	4	—	Both " short "
869	4	61	59	56	43	38	25[1]	27[2]	30	37[3]	36	38	36[4]	All " short "
3	4			Newly calved			19[1]	19	20	20[2]	19[3]	14	16	All " short "
790	4	17	17	16	14	16	16[1]	15	13[2]	13	15	14	15	Both " short "
211	4	23	19	20	20	20	17[1]	19[2]	5	9	9[3]	4[4]	3	3rd injection 24 hours
G11	3	12	14	14	14	13	13[1]	8[2]	5	5	—[3]	—	—	3rd injection 24 hours
117	2	22	22	18	18	16	18[1]	16[2]	12[3]	12[4]	3[5]	—	—	4th injection 24 hours
947	3		Calved		42	42	35	16[1]	16[2]	8[3]	4	4	4	3rd injection 24 hours
195	4	21	23	23	27	27	26[1]	17[2]	15	17	15	16	15	
G33	3	19	19	19	19	18	15[1]	17[2]	18	19	19	20	20	
G2	2	20	20	21	20	21	19[1]	20[2]	16	3	—	—	—	All " short "
G68	4	30	29	28	27	27	19[1]	25	20[2]	18	18	17	9	
132	3	17	17	18	17	13	17[1]	12[2]	12	10	11	9	7	
40	4	31	32	28	27	25	26[1]	20[2]	19	18	16	13	10	
Total	55	348	347	376	361	342	313	286	244	218	193	173	135	
Average per cow	3	22	22	23½	23	21½	18½	17	14½	13	11	10	8	

The small figures indicate the number of injections and point where these were given.
All averages after treatment are calculated as though all 17 cows were still being recorded.

rise if she had not been treated. Secondly, Cow No. 869 dropped so rapidly before treatment and rose so rapidly after treatment and also gave such a high general yield as to upset the averages. On the other hand there are certain factors which make the drop in yield after treatment appear greater than it should be. Firstly, Cows 947 and 117 had three injections, the third being in the case of 947 of 24 hours' duration. Secondly, Cow G2, although returning to approximately normal yield after the second injection, then suddenly developed an acute mastitis due to streptococci which were distinct serologically and otherwise from those originally present and in fact of a kind not commonly found in the udder. Thirdly, one cow (G20) and probably another (230) were being purposely dried off because they were shortly due to calve again; a marked drop in yield is shown for both, but they were injected in two quarters and one quarter respectively and the drop was not wholly due to the injections.

On the whole these interfering factors appear to cancel one another to a large degree and it may be said that the figures given support the view that after two treatments the yield may be expected to be approximately normal within a week.

Injection of Distilled Water.—Two cows (897 and 969) were injected with distilled water only. Both of these were infected in four quarters and in neither case did the injection exert any beneficial effect. Slight disturbance followed the injections and the yield was depressed somewhat for a day or two but was normal at the next recording. The trend of the milk yield was similar to that of cows treated with entozon, *i.e.*, over a period of three weeks subsequent to the first treatment there was a drop of about 3 lbs.

Acriflavine

The general method of procedure was the same as that already described. Latent and clinical cases were treated at all stages of lactation and in the dry period. Bacteriological examinations of the milk were made at intervals up to two months after treatment, and if the quarter remained free from streptococci during this period it was considered to have been sterilized. Actually, in the

majority of cases, it was possible to follow up the treated animals for much longer periods than this. Examinations ceased either when the cow was removed from the herd or when the investigation had to be closed.

Method of Working and Strength of the Solution.—The technique of the injection was similar to that already given. The acriflavine was put up in tubes containing 5 c.c. of a 1 : 50 solution so that the addition of one tube to every litre of distilled water would give a solution of 1 : 10,000 concentration.

For the preliminary washing of the teat canal and milk sinus, the solution was always used at a concentration of 1 : 10,000. For the actual injections, two methods were used. In the first of these, about 1,000 c.c. of 1 : 10,000 were injected. In lactating cows this was left in the quarters for five minutes from the time of completion of the injection ("short" treatment) before being thoroughly stripped out. This procedure was repeated after an interval of one week. With dry cows, the method was the same, except that the solution was left in the quarter for 24 hours before being stripped out. In this case only one injection was given.

The second method differed in that after injection of about 1,000 c.c. of 1 : 10,000 solution, a further 400 c.c. of a 1 : 1,000 solution was then injected. The whole injection was left in the quarter for two or three minutes and then about 500 c.c. was milked out. The remainder was left in the quarter which was then thoroughly stripped out three or four hours later. This treatment was repeated after an interval of one week.

Results.

Latent Mastitis. — Twenty-three quarters belonging to 17 cows (Nos. 1 to 17)—Table 7—infected with *Str. agalactiae* and in which the mastitis was of the latent type were treated with two five-minute injections of 1 : 10,000 acriflavine solution. Twenty of the 23 quarters treated were found to be free from streptococci when bacteriological examinations of the milk were made at intervals up to two months after the second injection. Subsequent examinations, in some cases up to nine months after treatment, did not reveal the presence of *Str. agalactiae* in any of the treated quarters. In three other quarters treated, streptococci persisted in spite of treatment. From Table 7 it will be seen that these three quarters in which treatment was unsuccessful belonged to two cows—Nos. 16 and 17. In two of the cows, Nos. 4 and 15, infection was later diagnosed in three quarters other than those originally

Table VII

Latent Infections Treated with Two Injections of 1 : 10,000 Acriflavine

Cow.	Quarters Infected.	Symptoms observed.*	Age of Infection (in Days).	Quarters Infected Two Months after Treatment.	Subsequent History.
1	LH, RH	Nil.	3	None	No quarters infected 6 months after treatment
2	LF	,,	8	(Cow dry)	No quarters infected in next lactation, 3½ months after treatment
3	RF, RH	,,	9	None	No quarters infected 4 months after treatment
4	LF	,,	9	RF	RF treated. No quarters infected 9 months after treatment
5	RF, RH	,,	10	None	Unknown : animal sold
6	RH	,,	12	None	Unknown : animal sold
7	LH	,,	20	(Cow dry)	No quarters infected in next lactation, 2½ months after treatment
8	LH	,,	22	(Cow dry)	No quarters infected in next lactation, 2½ months after treatment
9	RH	,,	23	None	No quarters infected 6 months after treatment
10	RH	,,	23	None	No quarters infected 6 months after treatment
11	LH, RH	,,	23	None	No quarters infected 5 months after treatment
12	LH, RH	,,	30	(Cow dry)	No quarters infected in next lactation 3 months after treatment
13	LH	,,	36	None	No quarters infected 5 months after treatment
14	RH	,,	38	(RH dry)	(RH previously treated with Entozon). LF, LH, RF not infected, RH dry 9 months after treatment
15	RH	,,	41	None	LF, RF infected 4 months after treatment. Treated and no infected quarters 3 months later
16	RF, RH	,,	42	LF, RF, RH	Infected quarters treated, but still infected 14 days later
17	RH	,,	158	RH	No further treatment. Animal sold

LF, LH, RF and RH indicate Left Fore, Left Hind, Right Fore and Right Hind.
*This refers to symptoms before treatment.

treated. The infections occurred at two and four months respectively after the first course of treatment. All three quarters were treated and were free from streptococci when examined up to nine and three months respectively. Thus, out of a total of 26 quarters (17 cows) treated, where the mastitis was of the latent non-clinical type, it was possible permanently to rid 23 quarters (15 cows) of *Str. agalactiae*. Treatment in three quarters (two cows) was unsuccessful.

Clinical Mastitis—Table 8—was diagnosed in eight cows, Nos. 18 to 25, involving 14 quarters. Treatment with two five-minute injections of 1:10,000 acriflavine solution resulted in the permanent disappearance of streptococci from nine quarters; two quarters (Cow 21) remained infected; one quarter (Cow 25) was permanently dried up; in two quarters (Cow 18) the result was unobtainable.

Three quarters of two cows (26 and 27)—Table 9—were treated during the dry period with one injection of 1:10,000 acriflavine solution, which was left in the udder for 24 hours. All three quarters were negative for streptococci after calving and remained so up to seven and ten months respectively, when the bacteriological examination ceased.

1:10,000 *Acriflavine followed by* 1:1,000 *for Milk Sinus.* Two cows with latent mastitis (29 and 31) and two with clinical mastitis (28 and 30) — Table 10 — were treated by a method somewhat similar to that recommended by Steck (1934 (3)) *i.e.*, 1:10,000 acriflavine solution followed by 1:1,000 solution. In five out of seven quarters treated in this way, milk secretion permanently ceased, and a bacteriological examination of the milk from these quarters was therefore not possible. The other two quarters treated were free from streptococci when examined at intervals up to two months but the secretion was so altered in character that it was unfit for consumption.

Immediate Effect of the Acriflavine Injection on the Cow.—No case was met with where the cow strongly objected to the injection of the solution. When the 1:10,000 solution alone was used, the cows showed signs of slight uneasiness for one or two minutes after the injection was completed. Paddling or kicking once or twice with the hind legs was the only symptom shown; in no case were severe symptoms of irritation exhibited. All signs of uneasiness had generally passed off by the end of 15 to 20 minutes.

TABLE VIII
CLINICAL INFECTIONS TREATED WITH TWO INJECTIONS OF 1:10,000 ACRIFLAVINE

Cow.	Quarters Infected.	Symptoms observed.	Age of Infection (in Days).	Quarters Infected Two Months after Treatment.	Subsequent History.
18	LF, RF	Very abnormal yellow secretion	3	(LF, RF dry)	Unknown. Animal sold
19	RF	Deposit 0·04 c.c. Teat injury	10	None	No infected quarters 5 months after treatment
20	LH, RH	Deposit 0·5 c.c. Watery secretion	14	None	No infected quarters 9 months after treatment
21	LF, LH RF, RH	Clots in fore milk Milk alkaline	23	LF, LH	No further treatment. Animal sold
22	RF, RH	Quarters tense and slight pain. Deposit 0·05 c.c. and 0·03 c.c.	39	None	No infected quarters 5 months after treatment
23	LH	Deposit 0·5 c.c. Abnormal secretion	44	None	All quarters infected 5 months after treatment
24	LF	Deposit 0·08 c.c. Swollen and tense	60	(LF dry)	LF regained function in next lactation. No infected quarters 9 months after treatment
25	LH	Deposit 1·5 c.c.	652	(LH dry)	In next lactation LH still dry. LF, RF infected

TABLE IX
COWS TREATED IN DRY PERIOD WITH 1:10,000 ACRIFLAVINE

Cow.	Quarters Infected.	Symptoms observed.	Age of Infection (in Days).	Quarters Infected Two Months after Treatment.	Subsequent History.
26	RF, RH	Slight fall in milk yield	51	None	No infected quarters 9 months after treatment
27	RF	Nil.	70	None	No infected quarters 7 months after treatment

Table X
Cows Treated with 1 : 10,000 followed by 1 : 1,000 Acriflavine

Cow.	Quarters Infected.	Symptoms observed.	Age of Infection (in Days).	Quarters Infected Two Months after Treatment.	Subsequent History.
28	RF, RH	Quarters swollen, clots in milk	2	None	Secretion from RF and RH considerably reduced and of a watery character; unfit for use
29	RF, RH	Nil.	59	(RF, RH dry)	RF and RH underwent considerable atrophy; did not function again in next lactation
30	LF, RF	Abnormal deposits	93	(LF, RF dry)	LF, RF underwent considerable atrophy; did not regain function 8 months later
31	RF	Nil.	210	(RF dry)	RF underwent considerable atrophy; did not regain function in next lactation

Table XI
Summary of Results in Quarters of Treatment with 1 : 10,000 Acriflavine Solution

Nature of Case.	Method of Treatment, Number of Quarters and Result.				Totals.	
	5 minutes.		24 hours.			
	Treated.	Cured.	Treated.	Cured.	Treated.	Cured.
Latent	26	23	3	3	29	26
Clinical	14	9	—	—	14	9

After the injection of 1:10,000 solution followed by 1 : 1,000 marked uneasiness was evident and this persisted for four or five hours. In one case the cow was visibly distressed, rumination was in abeyance and the cow refused food for 24 hours.

Effect of the Acriflavine Injection on Milk Secretion. — The intra-mammary injection of 1 : 10,000 acriflavine solution in cases of latent mastitis infections caused little disturbance in the milk yield or in the character of the secretion. In cases of clinical mastitis it was associated with a rather more severe reaction of the udder tissue, and the amount of secretion dropped somewhat for a few days, becoming thickened and containing more "clotty" material. On reference to Table 8 it will be seen that in four quarters the secretion ceased as a result of treatment. These cases were rather more acute infections than the others treated, and this possibly accounts for the cessation of milk secretion. One of the quarters regained its function in the next lactation whilst one remained permanently dry; the subsequent history of the other two quarters (Cow 18) is unknown as the cow was sold.

In both latent and clinical cases the secretion was stained yellowish-green for two or three days, after which it usually returned to normal both in odour and character. The owner states, "In almost all cases the milk was normal after two days. We had, however, one or two cows where the milk was always of a satisfactory consistency but where the acriflavine colour persisted for seven days, rendering the sample unsuitable for sale. On the first two days after injection our men report, and my own observation agrees, that the only noticeable difference in the milk was a slight wateriness, and the yellowish-green colour of the acriflavine. Occasionally a small amount of clotty material of the same colour was also passed."

The method of treatment in which the 1 : 10,000 solution was followed by 1 : 1,000 was found to be unsatisfactory in that its action on the udder tissue was too severe. Seven quarters were treated by this method; in five of these there was entire cessation of milk secretion shortly after the second injection and in the interval between the first and second injections the secretion was so altered in character that it was unrecognisble as milk. In the other two quarters treated in this way there was permanent reduction in milk yield, and the secretion remained of a very watery character. In all quarters treated in this way, marked atrophy resulted, and those that went completely dry never regained function.

DISCUSSION

A method of treatment of the common chronic contagious mastitis which will alleviate the obvious symptoms and promote a return to normal secretion must appeal to an owner,

faced with immediate loss, but it will not be of permanent value unless the basal cause, *Str. agalactiae*, is removed. Before a method of treatment is regarded as satisfactory, it must therefore be shown by adequate methods that the udder has been freed from this organism. In achieving this freedom, however, certain practical considerations have to be borne in mind, *viz.*, that a high proportion of cures must be effected by one or at most two treatments (otherwise the cost is too high), that the immediate loss of milk caused by the method is not too great, and, finally, that it causes no permanent reduction of the milk yield. These practical considerations are especially important if latent cases of mastitis, *i.e.*, cases which show few or no obvious symptoms, and are milking normally, are to be treated.

There are two main reasons why cases should be treated during the latent stage. Firstly, there can be little hope that a chronically affected udder, often markedly indurated, will regain its function and, secondly, the chances of cure are very considerably greater in cases which are treated early. Reference to Tables 4, 5 and 11 will show this clearly; quarters treated within a month or two of infection were cured in nearly all cases, those in which infection was older but still latent were cured in over 70 per cent. of the cases, whilst only 30 per cent. of the clinically infected quarters were cured. Moreover, when the cow is taken as the unit instead of the quarter, this point is emphasised still further.

In order that cases may be treated early it is essential that periodical bacteriological examinations of milk shall be made, for only in this way can infections be caught in the early stages. In fact, regular cultural examination of milk samples and chemotherapeutic treatment may be regarded as complementary. On the one hand, regular cultural examination enables new infections to be diagnosed early, *i.e.*, when treatment is likely to be successful, and it also provides a constant check on the efficacy of treatment, whilst, on the other hand, prompt treatment of new infections is of considerable value in removing potential sources of further spread.

Both the five-minute method of treatment for lactating cows and the 24-hour method for dry cows gave good results. Whilst in this series the latter were slightly better, the numbers are not sufficient to make any general conclusion justifiable. The reports of other workers also give no clear indication on this point. In view of the fact that nearly all cures were effected by two treatments, although up to five five-minute treatments were tried in some cases, it would seem that more than two treatments are only worth while where a single quarter has proved resistant and the cow is of particular value. Even then, if the cow is approaching the dry period it is probably best to postpone further intervention until she is dry and then give two 24-hour treatments. More than two 24-hour treatments were never given.

There is no evidence that the stage of lactation at which treatment is carried out influences the chances of success, at any rate from the middle of lactation onwards. Certain workers have advised that newly calved animals should not be treated but we have little data on this point; the results in Cows Nos. 3 and 947, however, give no support to the view that an unusually severe reaction is to be expected.

In view of the fact that following both methods of treatment there is a temporary udder disturbance resulting in the milk being unsaleable for some days owing to clots or discoloration, and that the state of lactation has apparently little influence on the chances of success, it would seem that the most practical time for treatment is when the milk yield has dropped to 10 to 15 lbs. per day. Two five-minute treatments can then be carried out with an interval of a week, and a resistant infection be treated by the 24-hour method as soon as the animal is dry. It is always best from the point of view of control to treat all infections at about the same time, but for practical reasons connected with the necessity of keeping up a level herd yield, that is usually not possible.

It is not easy to draw altogether satisfactory conclusions regarding the effect of treatment on the milk yield because of the difficulty of predicting the yield for a period of weeks; moreover, if averages are taken, calculations are apt to be upset by the fact that cows normally go dry at irregular intervals or are dried off because the next calving is imminent, whilst a particularly high-yielding cow may upset the averages. Consideration of the data given in Table 6, however, in various ways seems to justify the conclusion that the yield was on the whole, after one or two five-minute treatments, little lower than it would normally have been and that, therefore, little or no permanent reduction of yield is caused. The yield and quality may be expected to be about normal one week after treatment. In certain cases treatment is followed by an immediate rise in production.

On the whole, even when allowance is made for the fact that the cases treated with acriflavine were at an earlier stage of the disease than those treated with entozon, it may be concluded that acriflavine (1 : 10,000) is at least as effective as entozon (1 :1,250) for latent infections. Moreover, since acriflavine

causes less disturbance, it is to be preferred.

The use of 1 : 1,000 acriflavine for the latter part of the injection proved much too severe and could only be used for the sterilization of a resistant infection in one quarter of a cow which it was desirable to keep in a herd which was otherwise free from infection. The findings of Steck (*loc cit*) should, however, be recalled here, *viz.*, that if trypaflavine is used in a solution of saccharose, apparently 20 per cent., the presence of the sugar reduces the retention of the dye solution and the subsequent disturbance, with the result that a more concentrated solution can be used without undue disturbance.

The pressure method of injection from a flask has the advantage that injections can be made more quickly than by gravity and the duration of the treatment is therefore better controlled.

Finally, a warning should be given on three points, *viz.*, use of solutions which are too concentrated, leaving the solution in too long and over-filling the udder. Failure to observe these desiderata may increase out of all proportion the disturbance which normally follows any injection.

Summary

Observations are reported on the treatment of cases of experimental, latent and clinical mastitis by the injection of entozon 1 :1,250 or acriflavine 1 : 10,000. The results were assessed by cultural examinations, those cases listed as cured being free from streptococci as long as the cows were available for examination—in most cases six to twelve months or longer.

Entozon.

(1) Experimental infections in nine quarters were all cured by one or two treatments of five minutes each.

(2) *Latent Mastitis.*—43 out of 60 quarters (71·7 per cent.), representing 15 out of 25 cows, were cured. Most of these were cured by either (*a*) in milking cows: two treatments of five minutes each (29 out of 46 quarters, representing nine out of 14 cows); or (*b*) in dry cows: two treatments of 24 hours each (ten out of thirteen quarters, representing five out of six cows).

In eleven quarters, representing five cows, in which five-minute treatment had failed, an attempt was made to effect a cure by subsequent 24-hour treatment. The attempt was successful in the case of four quarters, but only one further cow was thereby totally cured.

(3) *Clinical Mastitis.* — Thirteen out of 37 quarters (35·1 per cent.), representing one out of ten cows, were cured. Most of these quarters were cured either (*a*) in milking cows: two to five treatments of five to ten minutes each (ten out of 31 quarters); or (*b*) in dry cows: two treatments of 24 hours each (two out of six quarters).

In ten quarters in which several five to ten minute treatments had failed, 24-hour treatments were subsequently given, but with success in only one quarter.

Most of these clinical cases had been affected for more than a year and all showed marked chronic symptoms.

(4) Marked disturbance followed the injections but had usually disappeared in 24 to 72 hours, though the milk remained slightly coloured for a day or two longer in some cases.

(5) Figures for 17 cows in one herd are given to show that, whilst individual variations occurred, there was, on the whole, little evidence of any permanent depression in milk yield which could reasonably be attributed to the treatment. All cows were treated when the yield was already dropping: some showed a greater drop than would normally be expected, others remained steady, whilst two cows showed a rise.

Acriflavine.

(1) *Latent Mastitis.*—26 out of 29 quarters (nearly 90 per cent.), representing 17 out of 19 cows, treated with 1 : 10,000 acriflavine, either during lactation or in the dry period, were cured.

(2) *Clinical Mastitis.*—Nine out of twelve quarters, representing five out of eight cows, treated during lactation with 1 :10,000 acriflavine, were cured.

(3) 1 :10,000 followed by 1 :1,000 solution was found to have too severe an action on the udder tissue. In five out of seven quarters treated in this way milk secretion was stopped, whilst all quarters showed a considerable degree of atrophy.

(4) The intra-mammary injection of 1 : 10,000 acriflavine caused little disturbance or interference with the milk yield.

Conclusion.

Chemotherapeutic treatment of early cases of *Str. agalactiae* mastitis (the common chronic contagious mastitis) by injection *via* the teat canal may be recommended, particularly as an adjunct to control by segregation of infected cows on the basis of cultural examinations of milk samples. Acriflavine 1 :10,000 is to be preferred. Milking cows should be given two five-minute treatments, dry cows two of 24 hours each. The results of treatment should be assessed by a cultural examination seven to 14 days after treatment, or after subsequent calving in the case of cows treated whilst dry. In either case a confirmatory examination

should be made one month later, or at the next herd test.

Our thanks are due to Messrs. Bayer Products Ltd., who gave us the entozon used in this work.

References

Bugge. (1923.) *Norsk. Vet.-Tidsskr.* p. 97. abs. *Deuts. tierärztl. Wschr.* **32**. 8.
Diernhofer, K. (1929.) *Tierärztl. Rdsch.* **35**. pp. 833, 852, 865.
Edwards, S. J. (1930.) *Proc. Roy. Soc. Med.* **34**. 1369.
———. (1933.) *J. Comp. Path. and Therap.* **46**. 211.
Gerke. (1935.) *Z. f. Infekt. Haust.* **48**. 95.
Gildow, E. M., Hansen, H. C., and Cherrington, V. A. (1933.) *J. Amer. Vet. Med. Ass.* **82**. 55.
Götze, R. (1931.) *Berl. tierärztl. Wschr.* **47**. 649.
Hucker, G. J., and Hansen, P. A. (1937.) N.Y. State Agr. Exp. Sta. Tech. Bull. 245.
Hucker, G. J., and Lee, D. A. (1932.) N.Y. State Agr. Exp. Sta. Tech. Bull. 205.
Jones, F. S. (1930.) *Cornell. Vet.* **20**. 206.
Kastli, P. (1937.) *Schweiz. Arch. Tierhlk.* **79**. 168.
Minett, F. C. (1934.) Proc. 12th Int. Vet. Congress. p. 511.
Minett, F. C., and Martin, W. J. (1936.) *J. Dairy Res.* **2**. 122.
Minett, F. C., Stableforth, A. W., and Edwards, S. J. (1930.) *J. Comp. Path. and Therap.* **43**. 163.
———. (1933.) *J. Comp. Path. and Therap.* **46**. 131.
Plastridge, W. N., Anderson, E. O., White, G. C., and Rettger, L. F. (1934.) Storrs. Agric. Exp. Sta. Connecticut. Bull. 197.
Plastridge, W. N., Anderson, E. O., Weirether, F. J., and Johnson, R. E. (1936.) *J. Dairy Sci.* **19**. 641.
Pröscholdt, O. (1928.) *Arch. f. Wiss. u. prakt. Tierhlk.* **58**. 485.
Rosell, J. M. (1933.) La Mammite streptococcique dé la Vache. Min. of Agric. Quebec province.
Schnorf. (1925.) *Schweiz. Arch. Tierhlk.* **67**. 25.
Seelemann, M. (1932.) Die Streptokokkeninfektionen des Euters. Schaper. Hannover.
———. (1933.) *Deuts. tierärztl. Wschr.* **41**. 259 and 337.
Seelemann, M., and Hadenfeldt. (1933.) *Milchwtsch. Forsch.* **16**. 101.
Seelemann, M., and Siemonsen, K. (1933.) *Arch. wiss. u. prakt. Tierhlk.* **67**. 10.
Stableforth, A. W. (1932.) *J. Comp. Path. and Therap.* **45**. 185.
———. (1937.) *J. Path. and Bact.* **45**. 263.
Stableforth, A. W., Edwards, S. J., and Minett, F. C. (1935.) *J. Comp. Path. and Therap.* **48**. 300.
Steck, W. (1931.) *Schweiz. Arch. Tierhlk.* **73**. 109.
———. (1934, 1.) Proc. 12th Int. Vet. Congress. p. 494.
———. (1934, 2.) *Schweiz. Arch. f. Tierhlk.* **76**. 559.
———. (1934, 3.) *Ibid.* **76**. 504.
———. (1936, 1.) *Ibid.* **78**. 42.
———. (1936, 2.) *Ibid.* **78**. 471.
———. (1936, 3.) *Ibid.* **78**. 555.
———. (1937.) *Ibid.* **79**. 1.
Steck, W., Gygax, E., and Dachis, M. (1936.) *Ibid.* **78**. 1.
Trautwein, K., Weisshaupt, A., and Wagener, H. (1934.) *Deuts. tierärztl. Wschr.* **42**. 736.

CLINICAL COMMUNICATION

Obscure Foot Lamenesses in the Horse

PROBABLE CAUSE AND OPERATIVE TREATMENT

V. BERWYN JONES, M.R.C.V.S.
Wonersh, Guildford

During the course of a systematic investigation into the causation of navicular disease—an investigation sadly interrupted by the exigences of general practice—I have come upon the following conditions of arterial disease or injury.

As is often the case, in my limited experience as a research worker, the first series of cases were all found in connection with the disease (navicular disease) that I was primarily engaged upon, so that in my enthusiasm I was anxious to conclude that my ambition was at last fulfilled and that here was the answer. However, it was not to be, for whilst I was obtaining a number of normal arterial radiographs, I found several diseased bones showing a normal arterial supply.

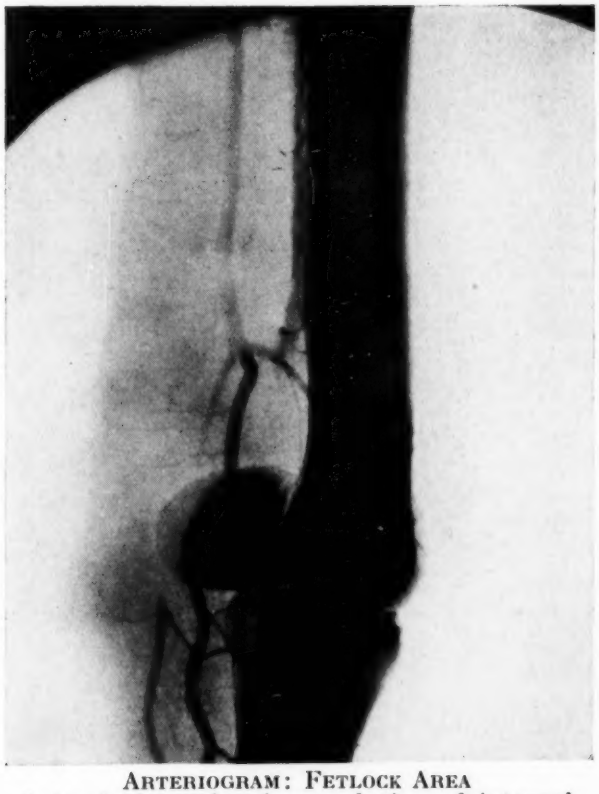
It is, I think, now generally known and accepted that the "text-book" symptoms of navicular disease are unrelated to the early case; the fact, therefore, that these cases of what now appears to be a thrombosis of the internal plantar artery, did not follow the classical rule of "starting lame but warming up sound," but were in fact a reversal of that process, did not unduly impress me, for a great number of undoubted and proved navicular cases have, in my experience, followed the latter history.

The accompanying prints of radiographs illustrate the normal arterial tree of the equine phalanges, and show also in comparison a case with the internal plantar artery blocked from above to below the corresponding sesamoid bone. This animal was a nine-year-old hunter that would go well on exercise, walking and trotting, but after about a mile of faster work would be badly lame, to recover after a rest—somewhat the history of an "iliac thrombosis" in a hind lameness. It may be that a considerable number of cases of obscure lameness in horses have their origin in a similar cause and that eventually, after obtaining an adequate collateral circulation, they recover, to the joy of the owner and the credit of the treatment provided by the attending practitioner.

The site of the arterial injury is one that lays itself open to damage; in fact, it is difficult to conceive how a horse with an "untrue"

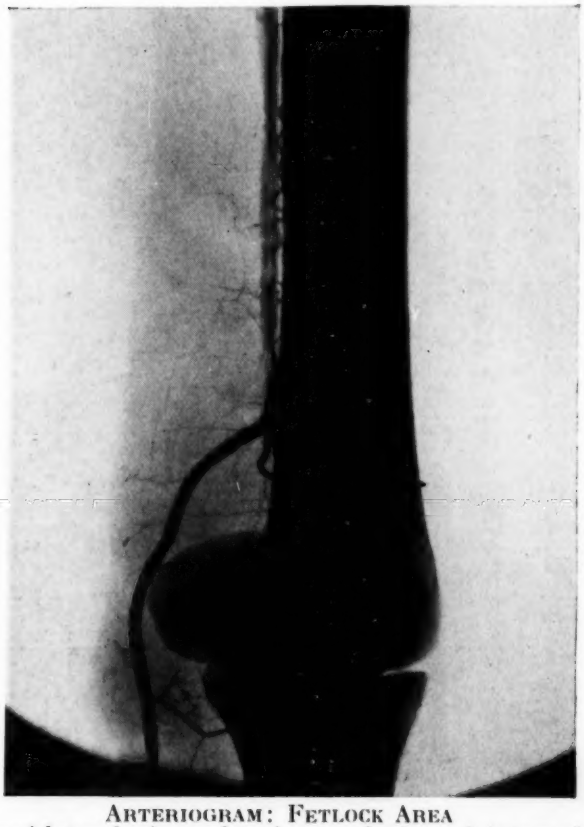
ARTERIOGRAMS: V. BERWYN JONES.

NORMAL ARTERIOGRAM
Antero-posterior view; phalangeal region.



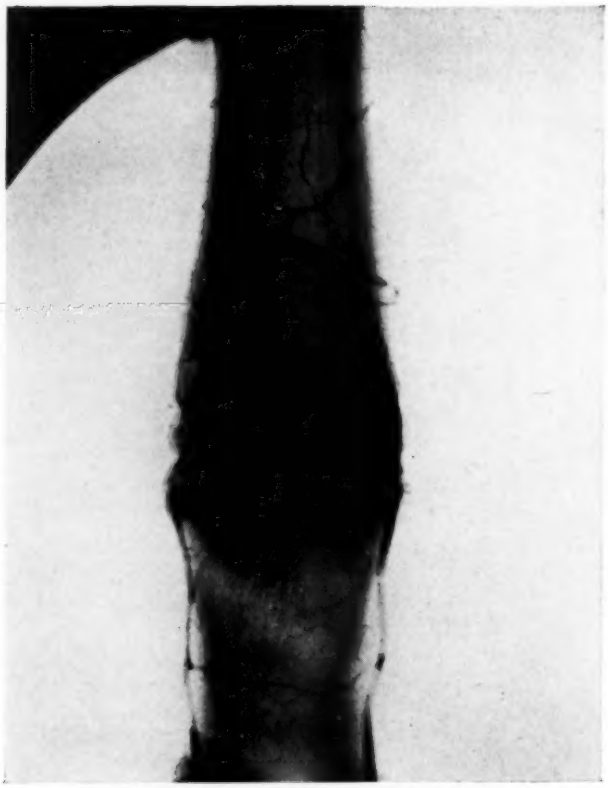
ARTERIOGRAM: FETLOCK AREA
Lateral view, showing occlusion of internal plantar.

NORMAL ARTERIOGRAM
Antero-posterior view; metacarpal and fetlock region.

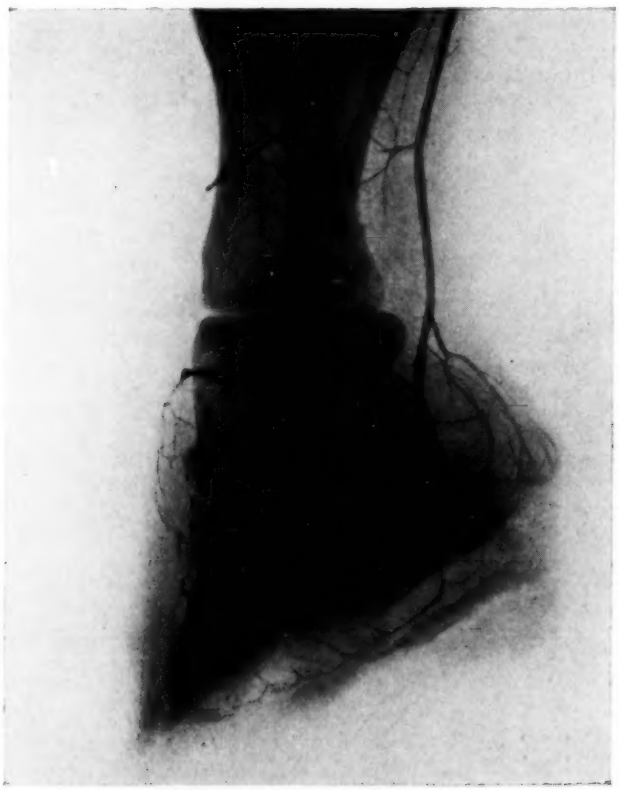


ARTERIOGRAM: FETLOCK AREA
Semi-lateral view, showing occlusion of internal plantar.

NORMAL ARTERIOGRAM
Semi-lateral view; fetlock region.



ARTERIOGRAM: FETLOCK REGION
Antero-posterior view, showing occlusion of internal plantar.



NORMAL ARTERIOGRAM
Semi-lateral view; phalangeal region.

action, or one that "goes close," can avoid, at some time, hitting just that area traversed by this particular length of artery.

In order to assist the formation of an adequate collateral arterial supply, or in any case to obtain a greater volume of blood to the foot, I have in a number of obscure and chronic foot lamenesses, assuming a plantar thrombosis, performed the operation of so-called peri-arterial sympathectomy, with encouraging success. The operation presents no great difficulty, and with reasonably careful dissection, is without danger. The site I select is the digital artery on the inside of the leg from about one-and-a-half inches below the head of the inner splint bone and immediately behind the perforans tendon. An incision of about three inches is made through the skin. Immediately under the strong fascia the neuro-vascular sheath is seen and the artery separated. At this site there is only one small branch, which may be severed and is easily ligated. After injecting the peri-arterial sheath with saline it is carefully dissected free and then mopped over with 95 per cent. alcohol in order to destroy any remaining nerve fibres; alternatively, the peri-arterial sheath may be injected with alcohol. It is, in any case, essential that the whole circumference of the artery over a distance in length of at least two inches is freed from its coat. An indication that the operation has been adequately performed is that the denuded length of artery will shrink to form a whitish cord; this temporary constriction is said to be followed by a dilatation of all the arterial tree, from the operative site to the extremity, and to give a largely increased blood supply to the limb for a number of weeks. The effect is said to be obtained in that the sympathetic nerves which control the constriction of the vessels run under the peri-arterial coat, and the removal or destruction of these nerves thus removes their normal tonic constrictor action.

I have found it wise to put a catgut suture or so in the fascia before suturing the skin, as my early cases, although they healed readily, showed a large bulge at the operative site. This did not appear to be due to a weakening or rupture of the remaining arterial wall, and almost disappeared after a month or so.

That the distribution of milk was one of the most extravagant services in any country was the opinion expressed by Mr. T. Baxter, Chairman of the Milk Marketing Board, speaking at the annual dinner of the Derby F.U. "There is nothing to stop 20 people going down one street to serve 20 houses," he declared.

ABSTRACTS

[**Infectious Bovine Mastitis. V.—Bovine Mastitis and Milk Yield.** White, G. C., Anderson, E. O., Johnson, R. E., Plastridge, W. N., and Weirether, F. J. (1937.) Bulletin 220, Storr's Experimental Station.]

A comparison was made of the milk yield of cows while free from chronic mastitis with the performance after infection. The study was made on the cows in two herds, one belonging to the Connecticut State College, and usually covered several lactation periods of each cow at least one of which was negative and one positive to the following mastitis tests: reaction to brom-thymol-blue, amount of sediment, leucocyte count and the isolation and identification of *Str. agalactiae*. In both herds cows whose udders were severely affected and whose yields were obviously diminished thereby were not included. The yield of 35 cows in the College herd and that of 22 cows in the other herd are presented and adjustments made for age, length of lactation period and number of milkings per day. With cows reacting in one or more quarters to all the above tests the average loss of milk, after infection, was 679 lb., or 6·5 per cent. per lactation in one herd and 559 lb., or 5·7 per cent., in the other. When one quarter only became infected there was no appreciable change in yield but as infection progressed the losses became significant, reaching 1,134 lb., or 12 per cent. and 1,111 lb., or 11·2 per cent., in the two herds respectively when all four quarters reacted. Using the leucocyte count, brom-thymol-blue test or sediment test singly for diagnosis a similar increase of the losses was found for all three tests as the successive quarters became involved. When judged by the presence of specific infection due to *Str. agalactiae*, however, it appears that much heavier losses were incurred than when abnormalities were detected by the non-specific tests. There was considerable variation in the response of individual cows to infection: some did not show any reduction in yield while others appeared to recover after having shown an initial loss. A few cows exhibited immediate and drastic reductions in yield which continued until permanently abnormal production was established. No influence on the fat percentage of the milk produced was observed.

S. J. E.

* * * * *

[**Healthy Cattle as Carriers of Coccidia.** Marsh, H. (1938.) *J. Amer. Vet. Med. Ass.* **92.** 2. 184-194.]

Several investigators have recorded the occurrence of coccidia in the faeces of apparently healthy cattle but others have been unable to confirm these findings. The author,

using the Lane centrifugal flotation method, was able to demonstrate the presence of coccidia in healthy cattle of the age at which coccidiosis usually occurs and also in the faeces of three calves from a herd in which an outbreak had recurred seven months previously. These results, the author admits, appear to support the view that coccidia are more or less normal inhabitants of the intestines of cattle but his investigations have not provided any evidence in support of the theory that clinical coccidiosis is the result of the activity of these parasites following a lowering of the host's resistance. It has also been the author's experience to find *Eimeria zurnii* as the predominant species in clinical cases of coccidiosis, whereas in recovered cases and in healthy animals *Eimeria smithi* outnumbered *Eimeria zurnii*. This would suggest that the species usually found in apparently healthy animals are of little pathogenic significance.

G. D.

* * * * *

[**A Clinical and Pathological Study of Nephritis in Dogs.** Bloom, F. (1937.) *J. Amer. Vet. Med. Ass.* **91.** 6. 679-699.]

This report is based on a series of 2,873 dogs of all ages and breeds, of which 186 (6·43 per cent.) suffered from nephritis. Among the latter there was a mortality of 25·32 per cent. The author emphasises that in the dog interstitial nephritis is of paramount importance, while glomerulo-nephritis is of little account, and that primary vascular lesions of the kidney are extremely rare.

Acute, subacute and chronic forms of interstitial nephritis, with focal or diffuse involvement, are described. The subacute and chronic types usually develop from the acute. Bloom gives an account of macro- and microscopic anatomical findings illustrated by ten photomicrographs.

Symptomatology is discussed at length: only a brief résumé can be given here. Uraemia, the essential symptom of nephritis, is regarded as a complex auto-intoxication resulting from the retention of the various urinary constituents which are largely end-products of protein katabolism. It may be acute or chronic, differing chiefly in duration and severity, and has different manifestations—nervous, alimentary, etc. Vomiting is the most constant symptom of nephritis: diarrhoea, when present, is the most striking. Other symptoms associated with the alimentary system are necrotic stomatitis, ammoniacal mouth odour, anorexia, polydipsia and, in some cases, constipation. Nervous symptoms exhibited are asthenia, listlessness, depression and a coma-like state. Fibrillary muscular tremors may occur but convulsions have not been observed. Congestion of the conjunctiva is common, especially in acute cases. Emaciation is a regular feature, particularly in prolonged chronic interstitial nephritis. Pain in the lumbar region is described as being very common in acute nephritis. Pruritus is occasionally observed, and sometimes eczema. Anaemia, which may be severe, occurs in chronic nephritis alone.

Fever, haematuria and oedema are rare findings, while hypertension and cardiac hypertrophy are infrequent.

Urinary changes in acute interstitial nephritis are—presence of albumin and casts, normal specific gravity, reduction in volume of urine voided and even anuria. In the chronic form there is present less albumin than in the acute, casts may be absent, specific gravity is low and there is polyuria.

Regarding diagnosis, the clinical picture should be considered in conjunction with blood and urine analysis. Qualitative urinary tests have a limited value, while in the author's opinion quantitative urine analysis should be discarded: quantitative blood analysis—estimation of either non-protein or urea nitrogen—has been found to be most useful in the diagnosis and prognosis of renal disease, particularly in renal insufficiency. Injection of phenolsulphonephthalein as a test of renal function is recommended.

J. W. W.

* * * * *

[**The Canine Prostate in Relation to Normal and Abnormal Testicular Changes.** Zuckerman and McKeown. (1938.) *J. Path. and Bact.* **46.** 1. 7-20.]

The authors have examined the testes and prostates of 243 dogs of various breeds and ages. When all the specimens were considered together by statistical methods, both age and body weight appeared to influence the size of the prostate. After about the eighth year of life, the prostate may either undergo involution or enlargement, the two changes being about equally common.

Enlargement is due either to glandular hyperplasia (by far the commonest cause) or, very occasionally (five cases), to metaplasia of the cylindrical epithelium to the squamous type. The latter change is exactly similar to that produced experimentally in dogs by the injection of oestrin and it is suggested that excessive production of this hormone is the cause of the condition.

Testicular tumours were found in 35 dogs; these consisted of interstitial cell tumours (three dogs), seminoma (17 dogs) and adenocarcinoma (15 dogs). Of the animals with testicular adenocarcinoma, five showed squamous metaplasia of the prostate: this is explained by the activity of the Sertoli cells comprising part of the tumours, these cells being homologous with the granulosa cells of the Graafian follicles of the ovary.

E. G. W.

The Veterinary Record

June 4th, 1938.

Chief Veterinary Officers

AFTER months of anxious preparation for the new State schemes for the control of the diseases of farm stock, Sir John Kelland retires from the post of Chief Veterinary Officer in the Ministry of Agriculture and Fisheries, his retirement having been delayed until the enlarged organisation necessary has been established.

During the 36 years which Sir John has spent with the Ministry, it has experienced many critical problems, many of which owe their solution to the help given by him. The present efficiency of the State Service in its attack upon outbreaks of foot-and-mouth disease owes its origin to the local organisation set up by Sir John in Cheshire in 1922-23. The present-day safe and comfortable transport of cattle in ships is due in no small measure to the regulations which he helped to frame a few years ago, while the disappearance of the export trade in worn-out horses owes much to the efficient system of inspection he put into operation. More recently he has strengthened the attack upon sheep scab but his greatest triumph must remain the inauguration of the comprehensive campaign against the more serious diseases of farm animals and the development of a State organisation in which are dove-tailed both whole-time officers and veterinary practitioners in a part-time capacity.

To Mr. Cabot, his successor, falls the task of marshalling the forces at his disposal and putting the requisite measures into operation with as little disturbance to the economic life of the farmer and veterinarian as possible, while ensuring that the schemes for disease eradication have every chance of success. He now has the difficult task of combining a scientific decision with a political one, for not only must he decide, from a survey of the disease position, when the time is ripe to initiate the next step, but he must try and make the scientific moment coincide with that most likely politically to ensure success. Mr. Cabot's task is an onerous one, but one which, like that accomplished by his predecessor, will find an important place in the veterinary history of this country.

We wish Sir John a happy, long and peaceful retirement, and we extend to Mr. Cabot our sincere wishes for the success of the difficult undertaking to which he is about to set his hand.

ANNOTATION

Internal Parasites of Pigs

Apart from various diseases associated with bacteria or viruses, pigs are affected by several kinds of internal parasites which constitute one of the more important causes of disease and loss in these animals. At the same time, pig parasitism has an important public health aspect since a number of swine parasites are transmissible to human beings. Within recent years pig husbandry has come into greater prominence as a result of the encouragement of pig breeding and although the parasites important in Britain include only a limited number of the many species infesting swine, they nevertheless constitute an appreciable source of loss to pig-breeders. In other countries where pig-raising is practised on a much more extensive scale than in Britain and where there are many more species attacking the animals, the problem of preventing losses among pigs and of controlling their parasites becomes one of major importance. This is particularly applicable to the United States of America, which rears approximately one-fifth of the pigs of the world and which produces, within her own boundaries, all the foodstuffs necessary for her huge pig population, consumes relatively large quantities of pig products and has an export surplus which is incidental only to her home market. In answer to numerous enquiries, largely from pig-owners who find evidence of infestation with parasites when their pigs are slaughtered, Schwartz (1937) of the United States Bureau of Animal Industry has prepared a bulletin dealing with the various and more important parasites occurring in swine. The purpose of this annotation is to furnish a précis of such knowledge of pig parasites as at present exists and which is contained in this and some other comparatively recent publications.

Pigs are parasitised by Protozoa, flatworms and roundworms, the last being the most important parasites of swine. These internal parasites show wide variations in structure, size, shape and habits; some occur in various parts of the alimentary canal, others in the lungs, liver, kidneys, muscles and other sites outside the digestive tract so that, taking into account the migration of larval worms within the body, practically all tissues and cavities

of pigs may contain parasites at one time or another.

Protozoa

Pigs are parasitised by a number of Protozoa including forms that are related to, if not identical with, those occurring in humans.

Dysentery-Producing Protozoa—*Balantidium coli*, a ciliated protozoan, which occurs in the large intestine and is to be found in many young pigs, in Britain and elsewhere, is apparently identical with a form occurring in humans in whom it produces balantidial dysentery, a disease which may be very severe and even fatal. The pathogenicity of this protozoan to pigs appears to be slight or absent, its main importance lying in the fact that humans, who may be working with swine infested with this organism, may accidentally ingest the resistant cystic stages which are discharged with the droppings and contract dysentery. If for no other reason, measures designed to control these parasites in pigs are indicated as a human health safeguard.

Coccidia.—Coccidiosis in pigs is due to *Eimeria debliecki* and related species in the intestine. In light infestations no symptoms are observed, but pigs with a marked infection show considerable scouring, become emaciated and generally unthrifty. Emaciation is very pronounced in extreme cases which may result in death. Pigs which recover from coccidiosis may continue to discharge oöcysts in their faeces for a long time; they thus act as carriers and may transmit the disease to susceptible animals.

Sarcocystis.—Another parasite, *Sarcocystis meischeriana*, which is presumed to be a protozoan but about which very little is known concerning its systematic position, life-history and mode of transmission, is not uncommonly found in pig muscles. The organism is of low pathogenicity and its economic importance slight. In general appearance, it is a whitish, fusiform body—the so-called "Meischer's tube"' filled with numerous small bean-shaped spores or "Rainey's corpuscles." Superficially it may be mistaken for a cysticercus or *Trichinella* cyst but when alive it can be easily differentiated by demonstration of the spores microscopically; when all three kinds of parasites die and become calcified a differential diagnosis is then more difficult.

Flatworms

(*a*) Flukes

The Common Liver Fluke.—Although *Fasciola hepatica* is primarily a parasite of sheep and cattle, it occurs in several other animals including pigs. It is encountered from time to time in swine kept on low, wet ground, where the intermediate snail hosts can live and liver fluke infestation is not generally a serious problem.

The Lung Fluke.—*Paragonimus westermanii*, which is somewhat like a coffee-bean in general appearance, occurs in cyst-like cavities in the tissue of the lungs and more rarely the other organs of the pig. This parasite has a wide geographical range including America but does not occur in Britain. Although no special symptoms have been noted in infested pigs, the presence of these flukes in the lungs produces an inflammation. There is no known treatment for the removal of swine lung flukes. A number of different flukes, in addition to *Fasciola* and *Paragonimus*, have been recorded from pigs in various parts of the world but none of them is of any considerable economic importance.

(*b*) Tapeworms

Although it is a strange fact that pigs are not known to become infested with adult tapeworms, they may harbour the larval or bladder-worm stage, one species developing into an intestinal tapeworm in man, and two other species developing into tapeworms in the intestine of dogs.

The Pork Bladder-Worm.—The adult tapeworm, *Taenia solium*, found in the human intestine, occurs in its larval stage in the musculature of the pig. The bladder-worm, *Cysticercus cellulosae*, is spherical to lemon-shaped and measures about one-fifth to two-fifths of an inch in greater diameter. In addition to various muscles this intermediate stage, the "pork measle," may become lodged in other organs such as the brain, liver, lungs, etc. When man swallows raw or incompletely cooked pork containing a live cysticercus, the head and neck of the bladder-worm is pushed out and, on reaching the intestine, the parasite attaches itself to the intestinal wall by means of the suckers and hooks on its head and develops in about two months into a gravid tapeworm which may measure from 3 to 6 feet in length. Pigs become infested as a result of swallowing either entire segments, each containing hundreds of eggs, or eggs, liberated as the segments disintegrate, and which have been passed by humans with their excreta. In the pig's intestine the eggs hatch and the larvae escape and migrate or are carried by the blood stream to the various sites in which they are known to occur where they become bladder-worms.

No definite symptoms are associated with *Cysticercus cellulosae* infestation, which is diagnosed, as a rule, *post mortem*. In most countries measly pork is condemned at meat inspection on account of the danger to public health, although lightly infested carcases are sometimes passed following the removal of visible cysticerci and efficient refrigeration, so that the worm is of greater importance as an

economic problem of the pig-producer than as a human parasite. There is no known practical treatment for the destruction or removal of cysticerci in the live animal but infestation can be prevented by a sound system of hygiene. This parasite is uncommon in the British Isles and is becoming rare in pigs in the U.S.A., being found only in areas where the level of human sanitation is still far below the accepted standards.

The Thin-Necked Bladder-Worm.—*Cysticercus tenuicollis* occurs embedded in the liver, attached to the abdominal organs or free in the abdominal cavity of pigs as well as sheep and cattle; the bladder may be an inch or more in diameter. The life-history is similar to that of the pork bladder-worm except that the dog harbours the adult tapeworm, *Taenia hydatigena* (or *T. marginata*). During life infestations of pigs with this larva cannot be diagnosed and if the infestation is light there is little or no injury; heavy infestations are said to be fatal to young animals. There is no known practical treatment for the removal or destruction of this parasite in living animals but the destruction of bladder-worms in pig carcases is an important method of controlling the spread of the worm. The proper disposal of inedible parts of slaughtered pigs and of pigs and other host animals that die on farms by deep burial or, preferably, burning will prevent dogs from becoming infested while the regular treatment of dogs for the removal of tapeworms will prevent the spread of infestation to swine.

Hydatid.—Although the larval stage of *Echinococcus granulosus* is found mainly in the liver and lungs of pigs it may occur in practically every organ of the body. In the liver the hydatid may attain the size of an orange. Dogs and other carnivores become infected by eating infested offal from slaughter-houses or carcases of dead animals not removed from pastures; pigs acquire hydatids by swallowing food or water or by rooting in soil contaminated with eggs from segments of the adult tapeworm which have been passed in the dog's faeces. No distinctive symptoms of hydatid infestation in pigs have been observed but the cysts, owing to their size and location, in particular in the liver and lungs, interfere with the functions of the various organs and the parasite is, therefore, to a considerable degree injurious. Preventive measures are similar to those against the preceding parasite and it is emphasised that the need for periodic treatment of dogs to remove the one-fifth of an inch long adult tapeworms is essential for controlling hydatids, since cysts occur not only in pigs but also sheep, cattle, horses and humans. In man, hydatids are very dangerous parasites and require, in many cases, a serious surgical operation for their removal.

Roundworms

Stomach Worms.—A variety of roundworms occur in the stomach of the pig only one of which, *Hyostrongylus rubidus*, is found in Britain. This delicate, reddish, thread-like worm, normally about one-fifth to one-third of an inch long, occurs on the surface of the gastric mucosa. It is transmitted directly from infested animals to young pigs through larvae which, after hatching from eggs passed on to pastures in the droppings of swine, develop to the infective stage. Alicata (1935) has studied the morphology and bionomics of the various stages of this parasite in some detail and has found that, at room temperature, infective stage larvae developed from eggs in seven days. Such larvae fed to guinea-pigs developed in the stomach without undergoing further migration and became adults in 17 to 19 days. He also found that third stage larvae were killed when subjected to air drying for four hours but survived for two and a half but not for three and a half months in water-charcoal culture. Pigs become infested with this parasite by swallowing food or water contaminated with infective larvae.

Two other stomach worms, which do not occur in Britain but are found in warmer countries, are *Ascarops strongylina* and *Physocephalus sexalatus*. Both forms are transmitted by various species of dung beetles which breed in pig manure and swallow the worm eggs passed with the faeces. Pigs become infested by eating infected beetles. Alicata, in addition to reporting two new insect intermediate hosts for each parasite, found that eggs of *Ascarops* hatched within 24 hours when fed to beetles and that larvae developed to the infective stage in about 29 days. He also found that the eggs of this parasite contained viable embryos after being kept four months at 22° to 24° C. (room temperature). Similarly, in the case of *Physocephalus*, eggs hatched within 24 hours when fed to beetles but infective larvae took 36 days to develop.

The presence of stomach worms is usually associated with a catarrhal condition of the stomach wall; they contribute generally to the emaciation and digestive disturbances characteristic of parasitic infestations. Carbon bisulphide administered in capsules or by stomach tube at the rate of 2 to 2½ fluid drams per 100 lb. live weight is recommended as effective in removing *Hyostrongylus* as well as the two other kinds of stomach worms mentioned.

Intestinal Threadworms.—In the U.S.A. *Strongyloides ransomi* is noted as especially common in pigs during the suckling stage and persists, usually in smaller numbers, for a long time after weaning. Young pigs having massive infestations with this parasite, which has rather an involved life-history, suffer from diarrhoea, become anaemic and fail to grow

normally. In Norway, Grini (1937) has found that *Strongyloides papillosus* is a common and serious cause of disease in pigs from one week to three months old and, apart from its own pathological effect, predisposes to secondary bacterial invasion.

The Large Roundworm.—*Ascaris lumbricoides* (or *A. suis*) is one of the most important of pig parasites. The adult worms normally inhabit the small intestine but may also occur in the stomach, large intestine and other parts of the body which have channels of communication with the gut, *viz.*, the bile ducts. The adult females produce, daily, thousands of eggs which are passed in the pig's droppings. These eggs are not infective until they have undergone development on the pasture or the floor of the sty. The eggs reach the infective stage, under favourable conditions of temperature and moisture, in about three to four weeks; Alicata (1935) found them to reach the infective stage in 16 days at 33° C., in 18 days at 30° C., and in 28 days at 22° to 24° C. Low temperatures and lack of moisture prolong the development of the eggs to several months. Pigs become infested by swallowing the embryonated eggs with food or water. The eggs hatch in the intestine and the liberated larvae penetrate the gut wall and are carried by the blood stream to the liver and thence to the lungs where they rupture the lung capillaries and escape into the alveoli. The larvae then travel up the bronchi and trachea to be swallowed and on returning to the intestine they settle down and grow to egg-laying maturity in about two to two and a half months.

Although the damage done by the adult worms is relatively slight compared with that by the migrating larvae, they may cause digestive disturbances and, if numerous, obstruction. The most extensive damage is done by the wandering larvae in the liver and more especially in the lungs where the trauma may be considerable. Many cases of "thumps" in young pigs are probably caused by *Ascaris* migration through the lungs, but other causes of "thumping" must not be overlooked. Young pigs, especially those four to five months of age, suffer more than older animals from ascariasis and it has been estimated that about a quarter of all pigs farrowed die from the pathogenic effects of this parasite. Those animals that survive a severe lung infestation often fail to grow and develop normally and cost more to produce than do healthy animals.

The most satisfactory treatment for the removal of adult ascarids is considered to be the administration of oil of chenopodium at the rate of ½ to 1 fluid dram per 100 lb. live weight, immediately preceded or followed by at least 2 fluid ounces of castor oil, or the drug may be administered in the oil. Pigs should be fasted for 18 to 24 hours prior to treatment and should not be fed or watered for three hours after treatment. Roberts (1934) advises two treatments at a ten-day interval. Very young or pregnant animals or those suffering from intestinal catarrh and certain other conditions should not be given this drug. Santonin, for a long time regarded as efficacious, is not very effective in the doses usually recommended but will remove a large percentage of worms in relatively large doses. The high cost of hexylresorcinol, which is fairly effective in its action, and the long period of fasting (at least 36 hours) make its use rather impractical. No known drug is of any use against the larvae during their migrations.

Control of ascarid infection can be successfully accomplished by following the now well-known MacLean County Swine Sanitation System. This system and certain modifications of it are described by Schwartz (1937) who observes that "with due attention to all the steps in the system, the number of sows required to produce a given pig crop can be reduced by as much as 33 per cent., thus effecting a considerable saving in the cost of production. Moreover, pigs raised under the sanitation system are noticeably uniform in size, runtiness being greatly reduced, and the time required for raising the animals to market age can be shortened by from four to eight weeks."

The Thorny-Headed Worm.—Although *Macracanthorhynchus hirudinaceus* is of doubtful occurrence in Britain it is a serious parasite in other countries. Superficially resembling *Ascaris* it may be distinguished by its anterior proboscis beset with spines by means of which it becomes firmly embedded in the gut wall. The parasite is transmitted to pigs by various kinds of beetles which, as grubs, become infested by swallowing the parasite's eggs that are passed in the faeces. In the grubs the eggs hatch and develop to the infective larval stage and swine find and eat such infected grubs or beetles when rooting in soil. A swelling or nodule appears at the point where the parasite attaches itself to the gut wall and sometimes the injury is so deep that the small intestine is perforated, causing a fatal peritonitis. Various drugs known to be effective against other pig parasites are rather ineffective against this species and in the absence of effective treatment control measures must be relied upon in preventing infection. Ringing the noses of pigs tends to keep them from rooting and swallowing infected grubs and beetles, while permanent and infected pastures should be avoided.

Nodular Worms.—Various species of *Oesophagostomum* occur in pigs, one of the commonest being *Oe. dentatum* which occurs in Britain and elsewhere. They occur, as adults, in the lumen of the large intestine and vary

in size from one-third to about one-half an inch in length. Pigs become infected by swallowing food or water contaminated with infective larvae that have developed on the ground from eggs passed in the faeces. Upon being swallowed the larvae enter the intestinal wall often at the site of a lymph follicle. The intestine becomes studded with nodules as a result of the invasion, each nodule containing a developing worm. Eventually the worms migrate to the gut lumen through a small opening at the summit of the nodule and become fully grown and sexually mature in about two months from the time of infection. Nodular worm infestation is a contributary cause of unthriftiness in pigs. The size of the nodule appears to vary with the species of worm responsible; sometimes the nodule is scarcely larger than a pinhead and at other times it may be much larger and conspicuously raised and highly inflamed and sometimes complicated by secondary bacterial infection. No satisfactory treatment is known but, of the various drugs which have been tested, hexylresorcinol has been found to be the most effective. A modification of the Swine Sanitation System is recommended for the control of these parasites.

The Whipworm.—*Trichuris trichiura* (or *T. suis*) usually occurs in the caecum and colon with its slender anterior end rather deeply embedded in the lining of the large intestine and the thick posterior part free in the lumen of the gut. Pigs acquire the parasites by swallowing eggs which are passed in the droppings of infested animals and which have developed to the infective stage. The time for development varies with the temperature and tends to be rather slow. Alicata (1935) found that eggs of this parasite contained fully developed embryos in 18 days when kept at 37·5° C., in 22 days at 33°, in 54 days at room temperature (22° to 24°), and in about seven months outdoors when kept underground and when the temperature varied from 6·1° to 24·5° C. The newly hatched larvae settle down in the large intestine and, so far as is known, develop there to maturity in four or five weeks. Massive invasions of *Trichuris* are injurious, producing weakness and emaciation. No effective treatment is known and the control methods recommended for *Ascaris* are also effective for the whipworm.

The Swine Kidney Worm.—Although absent from Britain, *Stephanurus dentatus* is a very serious pest in moist, warm countries. This somewhat thick worm, measuring from an inch to a little more than two inches long, occurs in the perirenal fat and sometimes the kidney tissue. The parasite's eggs are passed in the urine, hatch in the soil and in the presence of an adequate supply of moisture and under favourable temperature conditions the larvae reach the infective stage in four or five days. Infective larvae can survive for several weeks in moist, shady situations but have little resistance to sunlight, drying or freezing. Pigs become infested by swallowing infective larvae with contaminated forage or as a result of lying down in moist places when the larvae, stimulated by the heat of the animal's body, become active and penetrate the pig's skin. Regardless of the path of entry, the larvae reach the blood stream and are carried to the liver, sometimes the lungs and other internal organs. Eventually the larvae leave the liver, continue their migrations in the abdominal cavity and settle down in the urino-genital system where they become sexually mature. Development in the body of the pig is slow, requiring six months or longer, as a rule. No striking symptoms apart from general unthriftiness and arrested development are characteristic of kidney-worm infestation. Owing, however, to their wide distribution throughout the animal's body, the worms produce serious damage in the tissues, particularly the liver, and under meat inspection procedure, considerable losses are sustained by pig-breeders owing to the rejection and condemnation of affected portions of a carcase; sometimes an entire carcase must be condemned. There is no known treatment for the removal or destruction of kidney-worms in living pigs. A modification of the MacLean County Sanitation System is, however, an effective method of control and involves the elimination of moist, shady places which favour the development and survival of infective material.

Lungworms.—In addition to the larval stages of intestinal and other worms, the pig may harbour the adults of three species in its lungs. *Choerostrongylus pudendotectus* and *Metastrongylus elongatus* as a rule occur in relatively large numbers while *M. salmi*, which has a restricted distribution, usually occurs in comparatively small numbers. They are all slender, whitish worms measuring up to about two inches long and are found mainly in the bronchi and bronchioles. In the lungs the worms produce large numbers of eggs, which are coughed up, swallowed and passed with the faeces and become embryonated. Earthworms become infested by swallowing such eggs which hatch and the larvae develop in the body of the earthworms to a stage in which they are infective to pigs. Swine become parasitised by swallowing infested earthworms which they bring to the surface by rooting and, as a single earthworm may harbour from a few up to 2,000 or more larvae, heavy infestations in a pig can result. The process of digestion frees the lungworm larvae from their intermediate hosts in the pig's alimentary canal and they penetrate the intestinal wall and proceed, *via* the lymphatic system, to the heart and thence to the lungs

where, in about four weeks after infection, the parasites develop to sexual maturity. In addition to mechanical obstruction of the bronchi by the adults, a catarrhal exudate is produced which, together with eggs and larvae, may occlude the alveoli and cause a bronchopneumonia. Young pigs have been known to die as a result of heavy lungworm infestations. No satisfactory medicinal treatment is wholly effective in removing the parasites from the lungs, while control of lungworm infestation involves arrangements which will reduce the number of earthworms in pastures and prevent pigs from rooting. A detailed study of the life history of pig lungworms including descriptions of their developmental stages in the various earthworm intermediaries and in the pig has been made by Schwartz and Alicata (1934).

Trichinosis.—*Trichinella spiralis* occurs not only in pigs but also in other animals that have carnivorous or omnivorous habits and in man, and is an important parasite from the public health viewpoint. Although known to occur in the British Isles it is uncommon. The adult worms in the small intestine measure from one-sixteenth to one-sixth of an inch long and are rather short-lived; before they die and are eliminated with the faeces, the female worms penetrate the intestinal wall and produce numerous larvae which are deposited directly in the lymph spaces. These larvae reach the blood stream and are carried to all parts of the body. When they reach the muscles, particularly the voluntary muscles, they penetrate the fibres and grow and about three weeks later they reach their maximum size, become spirally coiled and a thin capsule about one-fiftieth of an inch in diameter forms round each worm, although occasionally two or more worms may be enclosed in a single cyst. The larvae, thus trapped in the muscle, undergo no further development until the muscle tissue containing them is swallowed by another susceptible host when the worms are liberated by digestion, pass into the intestine and in a week or so become adult and produce a new generation of larvae which migrate to the muscles and ultimately become encapsuled there. Pigs become infested by eating scraps of pork, rats or mice containing encysted larvae; humans usually acquire infestation as a result of eating raw or imperfectly cooked infested pork.

Trichinosis is practically never diagnosed in pigs during life although in severe infestations, when the larvae invade the muscles about the second week after infection, pigs may move about stiffly or lie motionless in one place. Unless the infestation is very severe, recovery is the rule and with the encystment of the worms in the muscles the symptoms gradually disappear. Encysted larvae may remain alive in the muscles for a year or longer but usually sooner or later calcification occurs. There is no known effective treatment for trichinosis in pigs or in any other animal. Control involves the proper housing of pigs and the elimination of sources of infection. Since the incidence of parasitism in garbage-fed pigs in the U.S.A. is between three to five times that in grain-fed animals (Hall, 1937) it is recommended that the feeding of uncooked pork and offal to pigs should be avoided. So far as public health is concerned, a strict system of meat inspection is very desirable.

In addition to those dealt with in this annotation, there are several other protozoan and helminth parasites which occur in pigs and which have not been mentioned because they are not of widespread importance or occur only rarely. It is pointed out that treatment of infested pigs for the removal of parasites, where this is possible, is an essential part of good management and since there is no known treatment that is effective in removing several kinds of worms, it is important to determine the species of parasite present before the feasibility of treatment can be determined or the method prescribed. Effective treatment cannot be administered with food, although this method may appeal to the pig-breeder, as some animals get too much of the drug and others too little. Treatment should be administered to each animal individually and the dosage computed on the basis of each animal's weight. Further, treatment is not a substitute for sanitation; so long as treated animals are allowed to remain in the place where the infection was acquired they are subject to re-infestation.

Although the control measures for each species dealt with have been outlined, it will be seen that the general principles involve a knowledge of the life-histories and habits of the various parasites and the intelligent application of the principles of sanitation to that knowledge. For normal growth and development pigs, like other farm animals, require sanitary surroundings, a balanced and adequate ration and relative freedom from parasites, and in this connection Schwartz mentions that "an eminent parasitologist stated that the way to control parasites in swine is to raise these food animals under less swinelike conditions." Moreover, since a number of pig parasites are transmissible to humans, sound management is important not only in the interest of proper pig husbandry but also in safeguarding public health.

J. N. Oldham.

References

Alicata, J. E. (1935.) "Early developmental stages of nematodes occurring in swine." *Tech. Bull. U.S. Dep. Agric.* No. 489. 96 pp.

Cameron, T. W. M. (1933.) "The internal parasites of pigs: a survey." *Vet. J.* **89** (2). 70-74.

GRINI, O. (1937.) "*Strongyloides papillosus* (*suis, longus*) hos griser." *Norsk VetTidsskr.* **49** (1), 1-13.

HALL, M. C. (1937.) "Studies on trichinosis. IV. The rôle of the garbage-fed hog in the production of human trichinosis." *Publ. Hlth. Rep., Wash.* **52** (27), 873-886.

HUNGERFORD, T. G. (1937.) "Internal parasites of the pig." *Agric. Gaz. N.S.W.* **48** (9), 520-524, 531.

ROBERTS, F. H. S. (1934.) "The large roundworm of pigs, *Ascaris lumbricoides* L., 1758; its life history in Queensland, economic importance and control." *Bull. Dep. Agric. Stock. Qd.* No. 1. 81 pp.

ROBERTS, F. H. S. (1937.) "Parasites of the pig." *Qd. agric. J.* **48** (4), 400-413.

ROBERTSON, D. (1937.) "Lungworms in pigs." *Scot. J. Agric.* **20** (4), 373-377.

ROSS, I. C., and KAUZAL, G. (1932.) "The life cycle of *Stephanurus dentatus* Diesing, 1839: the kidney worm of swine, with observations on its economic importance in Australia and suggestions for its control." *Bull. Coun. sci. industr. Res. Aust.* No. 58.

SCHWARTZ, B. (1937.) "Internal parasites of swine." *Fmrs.' Bull. U.S. Dept. Agric.* No. 1787. 46 pp.

SCHWARTZ, B., and ALICATA, J. E. (1934.) "Life history of lungworms parasitic in swine." *Tech. Bull. U.S. Dep. Agric.* No. 456. 41 pp.

VAN VOLKENBERG, H. L. (1936.) "Parasites and parasitic diseases of swine in Puerto Rico." *Bull. P. R. agric. Exp. Sta.* No. 38. 14 pp.

FARM PLUNDERING BY MOTOR LORRY

Reports from the Eastern parts of England state that motor gangs of poultry thieves, are responsible for very heavy losses to farmers in that area, the loss amounting in some districts to several hundreds of pounds, while in one instance, no fewer than 700 birds were removed from a single farm. So trying has the evil become in Essex that the Farmers' Union of that county has requested the police authorities to place night patrols on the roads with a view to checking these depredations. It is believed that motor lorries are largely used for the conveyance of the thieves and of their plunder. It appears probable also, that the same class of vehicle may be held responsible for much of the recent increase in sheep stealing in Scotland. Before its use became general the movement of sheep was necessarily slow and any stranger in a district droving sheep was at once subjected to close observation, while his flock would undergo careful scrutiny as to ear-marks, horn brands, buists and keels. Nowadays, however, a sheep stealer equipped with a motor lorry and a quiet working dog can easily round up a number of sheep from a lonely hillside before dawn, load them up quickly, and within a few hours be 50 to 100 miles distant from the scene of action. Transport of stock at night, or in the early morning is now of so common occurrence that no one pays particular attention to such movements; and even if suspicions are aroused, it is impossible to inspect or identify stock in a rapidly moving vehicle. We would suggest that all consignments of livestock should be accompanied by some evidence of their origin and destination, and that such evidence should be subjected to the inspection of the police or of any competent authority.—*Scottish Farmer.*

REPORT

Development Commissioners

TWENTY-SEVENTH REPORT*

The sum distributed by the Commission in 1936-37 on agriculture and rural industries was £551,538 as against £555,201 in 1935-36, while the amount spent on fisheries and harbours increased from £85,925 to £172,199 in the same period. The grant to the Agricultural Research Council for the Field Station, for research and for administration, amounted to £61,000. Grants in respect of capital expenditure of interest to the veterinary profession included £6,550 to the National Institute for Research in Dairying; £5,340 to the University College of Wales, Aberystwyth, Dairy Department; £4,000 to the Rowett Research Institute, Aberdeen, and £9,800 for new buildings and £3,200 for an investigation into grass sickness of horses to the Animal Diseases Research Association, Moredun.

Most of the maintenance grants sanctioned show a slight increase on those of the previous year and those of particular interest are £12,997 to the Animal Nutrition Institute, School of Agriculture, Cambridge; £13,000 to the Institute of Animal Pathology, Cambridge; £16,050 to the National Institute for Research in Dairying, Reading; £4,795 to the Research Institute, Royal Veterinary College, London; £16,850 to foot-and-mouth disease research; £14,123 to the Rowett Research Institute, Aberdeen; £5,606 to the Animal Diseases Research Association, Moredun; £6,890 to the Hannah Dairy Research Institute and £1,370 towards pig husbandry research at Harper Adams and Wye Agricultural Colleges. The report includes a complete list of all advances recommended by the Commission during the year.

Short accounts of the administration and finance of the various research institutes are given. The scientific work of the institutes is reviewed in the reports of the Agricultural Research Council. The report also contains interesting details of the other activities of the Commission concerning fisheries, the construction and improvement of harbours and the acquisition of land for road improvement.

J. C. W.

*Being for the year ended March 31st, 1937. From His Majesty's Stationery Office. Price 2s. 6d.

REVIEW

[**Veterinary Surgery (Dollar).** Third Edition, edited by Professor J. J. O'Connor. pp. x+990. Baillière, Tindall and Cox, 7 and 8, Henrietta Street, W.C.2. Price 30s.]

This old and familiar text-book has been brought still further up to date in its latest edition. The subject matter has undergone re-arrangement in certain respects, and although alterations have been made in the light of additions to surgical knowledge, yet, by the elimination of repetitive procedure common to a number of operations and the yet more concise rendering of descriptions, the book remains within one thousand pages. The additions include a chapter on skin diseases, operative narcosis by the pentothal and nebutal methods, epidural anaesthesia and the treatment of fractures by the use of unpadded plaster casts.

One cannot, in reading the work through, help being conscious that the ground covered over three or four species of animal is becoming too vast for it to be humanly possible to include everything in a single volume. As Dollar's work originally was the *vade mecum* of the large animal surgeon, it is worth consideration whether it would not be wiser to confine its sphere to this end. For instance, the equipment of a canine operating theatre in many canine practices is as elaborate as its human counterpart and should be dealt with in a text-book of this kind. Reference to p. 201 of the present volume and the succeeding pages, makes it obvious that the operative technique described is that of the large animal surgeon under field conditions. The use of rubber gloves; special surgical apparatus, such as canine operating tables, sterilising apparatus, etc., are surely worthy of description and illustration, if the canine side of our work is to be worthily represented in a surgical text-book.

There seems to be no way out of the difficulty but to let subsequent editions be split up into volumes dealing with the differing species, with, if necessary, specialist collaboration.

With this reservation the volume remains, as it always has been, an indispensable book for the practitioner.

N. D. Dhakmarvala, President, Bombay Veterinary Medical Association, writes that following a deputation of some members of the Association to the Hon. Mr. Morarji R. Desai, the proposal to remove the Bombay Veterinary College to Poona and amalgamate it with the Agricultural College has been abandoned.—*Times of India.*

N.V.M.A. DIVISIONAL REPORT

Sussex Veterinary Society*

MEETING AT BRIGHTON

A meeting of the Sussex Veterinary Society was held at the Ship Hotel, Brighton, on February 4th, 1938, with the President, Mr. H. Scott Dunn, in the chair.

There were also present Messrs. A. J. Alexander, W. S. G. Angus, L. S. Balls, S. E. B. Balfour-Jones, W. P. Blount, J. B. Buxton, E. Clark, C. Crompton, J. B. Djer, J. J. Edgar, Sam Gourley, S. E. Holmes, L. Jordan (Hon. Secretary), F. Marks, D. H. MacDonald, J. W. R. Pearce, J. W. Pritchard, R. Renfrew, Charles Roberts, F. B. O. Taylor and Henry Taylor.

Messrs. F. W. Priestley, N. J. Scorgie and A. W. Stableforth attended as visitors.

The Late Dr. O. Charnock Bradley.—The President said that prior to the commencement of the business of the meeting, he wished to say a few words in memory of the late Dr. Bradley. He had been a student under Dr. Bradley, and he was sure that the veterinary profession as a whole, and the "National" in particular, had suffered a great loss by his death. He would ask the members to stand in silence for a few moments in Dr. Bradley's memory.

The minutes of the last meeting, held on October 15th, 1937, having been printed and published in the *Veterinary Record*, were taken as read and were confirmed.

Arising out of the minutes, the President reported that the sub-committee appointed to consider the submission of a report to the Registrar of the Royal College of Veterinary Surgeons upon the action of a veterinary surgeon in East Sussex had considered the matter and were of the opinion that this was purely a matter for consideration by the Registration Committee, and that the complaint should be forwarded direct to them either by Mr. Blount or the owner of the herd in question. Mr. Blount reported that he had forwarded full details of the case to Dr. Bullock.

Correspondence.—(1) A circular was received from the General Secretary of the National Veterinary Medical Association regarding the scheme for R.S.P.C.A. clinics. It was resolved, "That the National Veterinary Medical Association be asked to send a copy of this circular to each member so that when it is brought forward for discussion at the Divisional Meeting each member will be thoroughly conversant with the proposals."

(2) A letter was received from the Secretary of the National Veterinary Medical Association

*Received for publication April 21st, 1938.

regarding nominations for the Dalrymple-Champneys prize. It was resolved, "That no nomination be made."

Election to Membership.—Mr. J. Edwardson, having been duly nominated, was elected a member of the Society.

Resignation of Hon Secretary and Treasurer.—Dr. Jordan stated that in view of impending change of office he felt it would be necessary for him to resign his position as Hon. Secretary and Treasurer. He was pleased to be able to state that Mr. Blount had intimated his willingness to undertake the office, and he had much pleasure in proposing that Mr. Blount be appointed. Mr. Pritchard having seconded this motion, it was unanimously resolved, "That Mr. W. P. Blount be appointed Hon. Secretary and Treasurer in the place of Dr. L. Jordan (resigned)."

On the motion of the President, seconded by Mr. Pritchard, it was unanimously resolved, "That the Sussex Veterinary Society do place on record its appreciation of the services rendered by Dr. L. Jordan whilst acting as the first Hon. Secretary and Treasurer of the Society."

Interesting Cases.—(1) Mr. L. S. Balls mentioned the case of a valuable bulldog which intermittently passed blood in its urine. He had been unable to trace the presence of any calculi, and a catheter was passed right through to the bladder. He thought it might be due to a calculus in the kidneys.

(2) Mr. S. E. Holmes mentioned that he had been called to make a *post-mortem* examination of the race-horse Ego which had dropped dead at Gatwick the previous day. He found that the heart weighed 10½ lb., and had a ruptured right ventricle.

Paper.—The President then called upon Dr. Stableforth and Mr. N. J. Scorgie to give a paper entitled "Entozon and Acriflavine for the Treatment of Chronic, Contagious Bovine Mastitis." [This paper is reproduced at the commencement of this issue of the *Record*.—*Editor.*]

A very interesting and animated discussion followed this paper, and Dr. Stableforth and Mr. Scorgie replied to the many questions which were asked.

[*Apology.*—Dr. L. Jordan would like to apologise to Dr. Stableforth and Mr. Scorgie, and the Society, that no note of the discussion is included in this report. Unfortunately during the change over of offices under Part 4 of the Agriculture Act, 1937, the draft copies of the minutes were inadvertently destroyed and the notes taken could not be traced.]

A very hearty vote of thanks to Dr. Stableforth and Mr. Scorgie was unanimously passed. The meeting then adjourned for tea.

L. Jordan (retiring), *Hon. Secretary.*

RETIREMENT OF SIR ARTHUR OLVER, KT., C.B., C.M.G., F.R.C.V.S.

(Specially Contributed)

We learn that on May 26th, Colonel Sir Arthur Olver relinquished his post as Animal Husbandry Expert, Imperial Council of Agricultural Research, India, proceeding on leave, preparatory to retirement. It is our privilege to publish the following tribute from a veterinary colleague, resident in India, who is particularly well qualified to assess the immense value of Sir Arthur Olver's services to that great Empire.

Sir Arthur is succeeded by Mr. Frank Ware, C.I.E., F.R.C.V.S., Officiating Expert Adviser in Animal Husbandry to the Imperial Council of Agricultural Research and Director of the Imperial Veterinary Research Institute, Muktesar-Kumaun, India.

. . . . .

When Olver arrived in India in April, 1930, to take up the appointment on the Imperial Council of Agricultural Research, for which he had been selected in England a few months previously, after retiring from the R.A.V.C., he was initiating a new era in veterinary science and livestock improvement work in India, and that country will ever have cause to remember the masterful and far-sighted manner in which he tackled the intricacies of his subject.

He arrived to find the fortunes of the Civil Veterinary Department at a very low ebb, for they had been without a veterinary representative with the Central Government for the previous 18 years. The arrangements in the different provinces for livestock improvement work varied considerably, in most cases consisting of an understaffed veterinary department restricted in its efforts to the cure and prevention of disease, while other activities connected with the maintenance of animal health and development of animal husbandry were provided for separately and often inadequately. At the centre, apart from the Muktesar Institute, which up to that time had concentrated on the control of bacterial, parasitic and virus diseases by the intervention of suitable biological products or drug therapy, there were two small units dealing with Animal Nutrition and Dairy Research, while some three or four herds of milch cattle were maintained at the different central research institutes.

When one remembers that in Olver, India had obtained an officer who, first and foremost, was a graduate in Veterinary Science and a good judge of animals, combining a sound practical knowledge with a scientific outlook and a wide vision in all matters connected with animal health, in fact possessing all the attributes of a complete animal husbandman, and if to these

is added a great charm of manner, it is easy to understand why his tenure of the post on the Imperial Council of Agricultural Research should have been attended with such marked success.

After joining his appointment one of the first points which arose for decision was the designation to be given to the post which he held, which up to that time had been variously referred to as Veterinary Expert, Livestock Expert, etc., and his foresight in selecting the designation of Animal Husbandry Expert has been amply confirmed on several occasions by subsequent events. One such occasion was the publication of certain figures, collected with the aid of a qualified statistician, relating to the value of the livestock industry in India. These figures were received almost with consternation at the time, for they showed that the annual value of India's livestock industry is greater than the value of her cash crops—a state of affairs which, of course, has been shown to exist in several other countries, but had not previously been imagined to be the case in India.

Having demonstrated the enormous potential value of her animals, and no doubt stimulated by recollections of early days spent under Theiler in South Africa, Olver set to work to organise a scientific background for the further development of these resources, and quite naturally, in a country which has long been the scene of some of the most devastating animal plagues existant, one of his first innovations was the introduction of a specially trained disease investigation officer in each of the major provinces and States. By a fortunate coincidence, it was just at this time that the Muktesar Institute, as a result of many years of patient work on the rinderpest virus, was able to place in the field its now well-known goat virus adapted for use as a vaccine against this condition, with the result that what previously had been an almost all-absorbing item of work in the programme of many of the provincial veterinary departments now became something to cause far less anxiety to provincial Directors. These officers were thus in a position to avail themselves more freely of the help of the recently appointed investigation officers in combating the more obscure inhibitory causes of the development of stock in India, several of which have since been shown to be due to parasitic infection or nutritional defects.

The provision of proper facilities for the investigation of animal nutrition problems on a scale commensurate with their importance in a country like India also claimed Olver's attention at an early date, and no doubt he would be the first to deplore the delay which has been experienced in placing this important part of any scheme of livestock improvement on a proper basis. However, the stage is now set for advances in this subject, with the addition of a well-equipped and properly staffed animal nutrition section to the existing organisation at Izatnagar, the plains sub-station of the Muktesar Institute. This, together with several subsidiary stations working on local problems in other places, which received Olver's constant support, should provide India with a satisfactory means of dealing with this important subject.

From animal nutrition it is but a short way to human nutrition, and one of Olver's earliest steps was to point out the importance of milk in the diet of a human population largely vegetarian, and at the same time to emphasise the fact that the *per capita* consumption of milk in India is far below what it should be, largely due, no doubt, to the small amount of milk produced by the average Indian cow. From the records maintained by the Indian military dairies and others he was able to show, however, that many Indian breeds of cattle have latent milking qualities of great promise and his unremitting attention to this subject undoubtedly stimulated great interest in it throughout India, with the result that a special investigation of the whole dairy industry was undertaken in the cold weather of 1936-37 by an expert from Great Britain, whose recommendations, including the enlargement of the Central Dairy Institute, largely follow the advice already given by Olver and are now in process of being implemented.

During the investigation of the milking qualities of Indian cattle the question of pedigree breeding naturally arose and here Olver found a subject very close to his own heart. Owing to the indiscriminate breeding which has been practised in India for many centuries considerable difficulty is sometimes experienced in determining the claims of a so-called breed of cattle, and controversies on this subject will no doubt continue for many years to come, but as a result of Government intervention herds of several of the more important and undisputed breeds have been maintained in a state of purity for some generations past and these will now form the nucleus of a scheme of pedigree breeding in the appropriate breeding tracts in the provinces and States, which Olver took great pains to foster. In the same connection he was instrumental in introducing herd book registers for seven recognised milch breeds of cattle and buffaloes, and with the expansion of this scheme it may be anticipated that cattle breeding will not again fall into the haphazard methods which were generally in vogue in India until quite recent times.

In addition, the question of sheep and goat breeding also occupied Olver's attention and as a result some definite advances have already been made, particularly in the matter of

developing some of the Indian breeds of milch goats. Nor was the poultry industry allowed to pass unnoticed, and although progress in this subject must necessarily be slow until more control has been obtained over the contagious diseases of poultry in India, yet the addition of a Poultry Research Section to the Izatnagar organisation, for which Olver was instrumental in obtaining sanction, should do much to place this industry on a better footing.

The provinces in India are now autonomous and even before Olver's arrival in the country the field staffs of the agricultural and veterinary departments had been transferred to provincial control, so that it is in the nature of things that he should have been able to introduce more improvements for the development of animal industry in the centre than in the provinces, but one point on which he was very insistent—and it is to be hoped that his efforts in this direction will not have been in vain—was that for animal husbandry extension work in India, a separate organisation, incorporating the existing veterinary staffs and financed from a budget of its own, should be set up in each province and State to deal with all aspects of livestock improvement. Such an arrangement has been accepted in principle as being the ideal one, but certain administrative details and the difficulty of finding a sufficient number of men completely equipped for this type of work have led to delay in its adoption in some of the provinces.

This brings us to the question of veterinary education, which is another subject to which Olver gave his attention. One of his first recommendations in regard to the provincial veterinary colleges, of which there are five in India, was that, unless already provided, a dairy farm should be included in their organisation, in order that the training of the students might have a greater bias towards Animal Husbandry, and in drawing up the scheme for a higher grade veterinary college in India, which was done under his direction, great stress has been laid on this side of the work and the subjects of Animal Nutrition and Animal Genetics will receive special attention in the curriculum.

If this proposed College be located at Izatnagar, which is the present intention, and when the other contemplated extensions on this valuable site have been carried through, India will be able to boast of a central organisation for Veterinary and Animal Husbandry research comparable with that of Onderstepoort in South Africa, and much of the credit for this must be allotted to Olver, who always gave the keenest support to any proposals put forward for the expansion of the Muktesar Institute.

It is sad but perhaps inevitable, for Rome was not built in a day, that Olver should not be able to see the completion of all these projects, which he did so much to foster, but he can leave India with the feeling that in eight years he accomplished a vast amount of work and laid very sound foundations for the advancement of the subject, regarding which he was such an enthusiast. Moreover, the high standard which he set will act as a rare example for veterinarians to follow, not confined to the limits of the country of his most recent labours.

Realising the magnitude of his accomplished task, it was no surprise, but nevertheless very welcome, to his colleagues in India to read of the knighthood which was conferred on him at the time of the Coronation of H.M. King George VI and those same colleagues now wish him God-speed and good luck in any further endeavours that he may undertake.

* * * * *

Mr. Frank Ware, C.I.E., F.R.C.V.S.

It is supremely fitting that Sir Arthur Olver should be succeeded in the important post of Animal Husbandry Expert, Imperial Council of Agricultural Research, India, by Mr. Frank Ware, C.I.E., F.R.C.V.S., who has spent the whole of his professional life in the Indian veterinary field and whose proven ability and experience in the performance of responsible duties, coupled with a wide knowledge of the veterinary problems and animal husbandry needs of the Indian Empire, ensure the maintenance and, so far as is financially possible, the expansion of the progressive policy to which the foregoing tribute bears witness.

Born at Theydon Bois, Essex, in 1886, the son of Mr. J. W. Ware, Frank Ware was educated privately and received his professional training at the Royal Veterinary College, London. Graduating in 1907, he secured his Fellowship in 1921. In the year of his graduation he joined the Indian Veterinary Service, in which his capabilities soon won for him recognition, he being appointed as Principal of the Madras Veterinary College and eventually Director of Veterinary Services, Madras. Following a period of notably efficient administration in that capacity, Mr. Ware, in 1929, found wide scope for his energies as Director of the Imperial Veterinary Research Institute at Muktesar-Kumaun. The reviews published in this journal, of his annual reports demonstrate the many improvements for which Mr. Ware has been responsible since he took charge there; they are of great administrative interest and reveal, with masterly conciseness, the magnitude of the work carried on at the Institute. On his being appointed last year as officiating Animal Husbandry Expert, Mr. W. Taylor, Principal, Punjab Veterinary College, acted in his place. Last year, in the Coronation

Honours List (May, 1937), Mr. Ware's outstanding services to veterinary work and research in India were recognised in the award to him of the Companionship of the Order of the Indian Empire.

Mr. Ware has contributed very informatively to the literature of the Protozoological, Helminthological and other branches of Veterinary Science, while his report on the progress in veterinary research in India during the past 25 years was a greatly appreciated feature of the proceedings of the Indian Science Congress held in Calcutta in January last.

ROYAL COLLEGE OF VETERINARY SURGEONS

Membership Examinations, 1938

LIST OF SUCCESSFUL CANDIDATES

ANIMAL MANAGEMENT

(*Continued from page* 658.)

Liverpool

Bee, B. R.
Clay, H. A.
Davison, F. L.
Edwards, C. M.
Edwards, D. B.
Ferguson, H. H.
Gibson, T. E. (credit)
Helme, John
Mahmoud, A. H.
McLaren, I. S.
Pickin, William
Protheroe, Stanley
Roberts, H. R. (credit)
Shaw, I. G.
Slinger, W. B. (credit)
Stabler, A. B. O.
Wilding, M. H.
Wilson, A. A.
Wilson, Miss B. H.

Dublin

Offord, E. C.
Bourke, S. E.
Carlisle, J. (credit)
Dodd, A. M.
Good, N. S.
Hutch, Liam (credit)
Kinsella, L. K.
Parkhill, Miss M. E.
Mahony, J. I. (credit)
Lynch, T. J. (credit)
Wallace, J. G.
Bowen, L. T.
Collins, W. C.
Donnelly, A. D.
San Htwe Maung
Kane, G. J.
McConnell, J. W. (credit)
Quinn, B. J. (credit)
Whitty, B. T.
Burns, N. M.
Brown, C. C. B.
Davison, W. F. (credit)
Gallagher, M. A.
Hunter, W. M. D.
Kavanagh, S.
McVeigh, D.
Thompson, T. W. (credit)
Yasin, S. A.

(*To be continued.*)

AMERICAN ANIMAL HOSPITAL ASSOCIATION

AN INFORMATIVE ANNUAL MEETING

The proceedings of the fourth annual meeting of the American Animal Hospital Association, held at Detroit in 1937, have just come to hand. A great deal of business was crowded into the first two days of the Congress, whilst the third was devoted to a pleasure trip. Our American colleagues are obviously indefatigable workers at their Congresses for we find that the Sessions commenced at 9 a.m. and terminated about 9 p.m. on the opening day; and that business occupied from 9 to 5 on the second day, followed by a dinner and an entertainment in the evening.

The papers and discussions concerned the following subjects:—

(1) Diseases of the nervous systems of the lower animals.
(2) Cineographic views of activities at the hospital.
(3) Roëntgen technique and interpretation.
(4) Radiological procedures.
(5) Diseases of the eye of lower animals and diagnostic procedures.
(6) The humane side of veterinary medicine.
(7) The thyroid and parathyroid glands.
(8) Report of committee on foods.
(9) A new method of treating fractures.
(10) Surgical technique.
(11) Orthopaedic surgery.

In addition to this comprehensive list of subjects, the usual committee reports and other routine business of the Association, were debated.

The President (Mr. J. V. Lacroix) in his opening address, reminded members that the Association existed primarily to establish and maintain a high standard for the hospital, the equipment, the personnel, and the methods employed. He very rightly stressed the importance and value of keeping accurate hospital records, as not only did these contribute to the improvement of methods in practice, to the accumulation of useful facts about diseases and their treatment, and to compelling careful attention on the part of hospital assistants, but they were of inestimable value in court when ligitation was necessary in the collection of accounts. He stated that an increasing number of veterinarians, who planned to build or remodel animal hospitals, consulted the Secretary regarding the standards that must be met in order to join the Association. Information thus obtained, often forestalled many costly mistakes in the construction of buildings. The exchange of ideas which had resulted from meetings had been of sufficient value to all who had participated to justify the existence of the organisation.

The President also asserted that the conspicuous exhibition of the Association's certificate of membership (which is given to member hospitals) assures all patrons of the hospital above designated that methods employed are regular, modern and humane. This gives the animal owner some degree of assurance that his pet will receive proper attention, that the hospital in question ranks well in its field and that the prospective client will be treated fairly.

During the past year the work done by the committee on foods had been of such a character that its effect would be felt for years to come. This work had been responsible for the beginning of a genuine and greatly needed reform in the commercial dog-food industry.

We are heartily in agreement with the President's observation that "where the volume of work attempted in the hospitalisation of animals is in excess of that which should be undertaken because of an undermanned staff, there is neither time nor opportunity for giving adequate attention to patients. In such cases the service rendered to a clientele is not sufficiently superior to that offered by the average kennel managed by laymen to warrant other than kennel fees. Such places do not merit the designation 'hospital.' We should remember that the successful treatment and hospitalisation of dogs and cats is the most highly specialised branch of veterinary practice; that the progressive veterinarian employs diagnostic methods that yield definite and dependable information whenever it is practicable to employ them; and that he seldom risks a guess. At present, intelligent owners of pets are rather well informed on many subjects that have application in our daily work, and it behoves us all to keep pace with progress or we shall soon be outmoded."

These are words of wisdom indeed, from which we gather that the competition of unqualified persons is as keen in America as it is in England.

. . . . .

Carl Schlotthauer's paper on "Diseases of the Nervous System in the Lower Animals" was prefaced by a brief but very useful review of the anatomy and physiology of the nervous system. It pointed out that there are many sporadic nervous diseases of lower animals, most of which have been described at some time or other; but, because of their comparatively infrequent occurrence and the difficulties encountered in diagnosis they frequently pass unrecognised. The study of nervous diseases in lower animals is, therefore, almost entirely limited to observation of definite organic lesions, and symptoms caused by neuro-toxins. Many of these conditions are terminal when they are first recognised. The aetiology of the many nervous diseases and abnormalities was so minutely detailed that the paper could not fail to be of the utmost diagnostic value to those who heard it.

The paper by Gerry B. Schnell upon the subject of "Roëntgen Technique" included a discussion upon anaesthesia, equipment, positioning of the patient, and made particular reference to and gave a description of the X-raying of selected parts of the body. Although it contained nothing new to veterinary radiographers, we think the subject is one which should be better ventilated at veterinary meetings, if only to enlighten practitioners as to the limitations of veterinary radiography in diagnosis. We entirely agree with the author when he states that the pooling of experiences is helpful and we consider that the institution of radiological meetings in our own country would be very desirable.

For restraint of his patients, Mr. Schnell expressed a preference for pentothal sodium, over all other methods of anaesthesia, not excepting morphia. He laid it down that a veterinary apparatus should generate sufficient kilo-voltage to give a fair image of the body of an average dog in half a second or less. But we believe that such an ideal is rarely if ever obtainable except with the most expensive apparatus; and that such a high initial outlay is not warranted in canine practice.

The author's instructions for obtaining an antero-posterior radiograph of the shoulder are inexplicable, for he says: "The casette is held vertically in front of the dog against the shoulder and chest, while the tube is placed flat against the ribs and aimed through the shoulder at the plate."

We cannot altogether commend the pinching of the nose of an anaesthetised dog to stop respiration whilst a film is exposed. We have not practised such a method, but would imagine that more movement of the dog would be occasioned in that way than would result from normal respiration.

Whilst we have heard views expressed by observers in this country that Legg-Perthe's disease actually does not occur in dogs, others have claimed that it does; and it is interesting to note that Schnell records having recognised and demonstrated this disease in several instances.

The essayist concluded by condemning certain dishonest acts perpetrated by a few individuals. One of these was the boast of a certain veterinarian that he used a single film of a peach stone in a dog's intestine as the basis of several lucrative laparotomies. Another, was the questionable practice of giving X-ray treatment with an apparatus which does not have sufficient voltage for therapy. As he said, "there is no evidence supporting homoeopathic X-ray therapy."

A useful review of some of the ocular diseases and abnormalities was given by Carl Schlotthauer,

but here again we observed no new departure from existing knowledge. At the same time, the study of the eye merits a great deal more attention than is normally accorded to it by the general veterinary practitioner, and an annual meeting of an important association is an opportune occasion to give it prominence.

Mr. L. A. Merillat very ably and thoroughly explored the humane side of veterinary medicine, and concluded by reproaching the veterinary profession for its lack of fixed policy in relation to vivisection. He observed that "to the proponents of animal experimentation we lacked the courage of our convictions; whilst to its opponents we remained a group of sinful experimenters."

A lengthy discourse upon the thyroid and parathyroid glands was delivered by G. W. Rawson, and although it comprised a wealth of information upon the physiology and pathology of these glands, it had to be conceded—at the outset—that most of what we know had been largely borrowed from the experiences of the medical profession or was the result of study on laboratory animals. If veterinary lore about the thyroid and parathyroid glands was not more extensive, it was because we had not given sufficient clinical study to the subject and had not been very diligent in publishing case reports in veterinary literature.

The Committee on Foods reported, among other matters, that it would soon have available a reliable list of chemically and biologically tested dog and cat foods which members of the Association could feed in their hospitals, and recommend to their clientele, with the assurance that the products met and maintained the standard of the Association; and that the labels and advertising would be truly representative of the contents of the container.

Otto Stader described a new method of treating fractures but from a mere description alone, and without any practical test, we are unable to decide whether it is a method to be commended. It provides for the immobilisation of bone fragments by somewhat clumsy-looking mechanical means, necessitating the drilling of two holes into each fragment, through which metal bars are placed. The method does not appear to us to supersede the plaster-cast method at present in vogue here.

Professor Partipilo dilated at great length upon surgical technique, the main burden of his address being the necessity for avoidance of traumatism when operating, the rational selection of incision sites, and the condemnation of incisions either too large or too small for the purpose in view. He knew there were many surgeons who prided themselves on the fact that they could operate through a small incision; but there was absolutely no reason to take pride in that, as it must sooner or later entail tugging and pulling on the abdominal wall or other structures.

His paper was full of interest and practical sound advice, and is well worth perusal. In fact, we strongly recommend our readers to obtain the full proceedings of the meeting, these being of especial interest to the canine practitioner.

In Parliament

Among the questions and answers recently recorded in the House of Commons are the following:—

Milk

Mr. Macquisten asked the Minister of Agriculture whether his attention has been drawn to certain experiments made by a body called the Hannah Institute, assisted by contributions from the co-operative societies and a large milk combine, by which the said institute are alleged to have satisfied themselves that over 60 per cent. of calves fed on fresh milk soon contracted bovine tuberculosis; and what steps does he propose to take in view of these experiments?

Mr. Morrison: I would refer my hon. Friend to the reply which I gave to my hon. and gallant Friend the Member for Ayr Burghs (Sir T. Moore) on November 1st last.

Mr. Macquisten: If these experiments are in order, is it then, part of the policy of the Hannah Institute that no cow should be allowed to nurse its own calf; and how is it, if these experiments are right, that we have any cattle at all, seeing that cows and calves have been fed on raw milk for untold generations; who supplied the milk in these experiments, and who supplied the obliging calves?

Mr. Morrison: My hon. and learned Friend will not expect me to be responsible for experiments conducted by a scientific body, but, as I said in the reply to which I have referred him, this is only one experiment. Many others are being carried out. It would not be safe to go by experiments of a narrow range, and we are trying to review the whole subject in the light of other experiments as well as this one.

Major Procter asked the Minister of Agriculture what organisations he has consulted in drawing up the terms of the new Milk Bill which is shortly to be presented to Parliament; and for what reason he has not consulted the National Federation of Milk Producer Retailers, whose interests are likely to be seriously affected?

Mr. Morrison: Informal and confidential consultations are taking place with representatives of the national organisations of local authorities, producers and distributors. Among these organisations are the National Farmers' Union and the Milk Marketing Board, both of which bodies include among their members or constituents large numbers of producer-retailers. I propose also to arrange for similar consultations with the organisation referred to by my hon. and gallant Friend.

. . . . .

Milk (Pasteurization)

Mr. Rostron Duckworth asked the Minister of Health whether any conversations have yet taken place with representatives of local authorities with regard to the suggested legislation under which they are to have power to decide whether or not there shall be compulsory pasteurization

of milk sold in the area under their control; and, if not, whether he proposes to have such consultations?

Mr. Elliot: Yes, Sir. My Department and that of my right hon. Friend the Minister of Agriculture and Fisheries are in consultation with representatives of the associations of local authorities concerned.

. . . . . .

Musk Rat Extermination

Sir Gifford Fox asked the Minister of Agriculture the total cost of exterminating the musk rat and the maximum number of people employed, and how many years it took to exterminate it?

Mr. W. S. Morrison: The net cost to my Department of exterminating the musk rat in England and Wales was £16,265. The maximum number of trappers employed on the work at any one time was 40, and the operations extended over approximately three years.

. . . . . .

Chemical Research

Mr. David Adams asked the Chancellor of the Duchy of Lancaster, as representing the Lord President of the Council, whether his attention has been drawn to the fact that in case of war the British Empire would be without access to important chemical compounds of which Germany has a virtual monopoly; whether he is aware that German firms producing these chemical agents do not as a rule grant licences for manufacture in this country; and whether any Government action is contemplated in view not only of possible war-time contingencies, but also of the continuous and urgent needs of the British tropical Empire?

The Chancellor of the Duchy of Lancaster (Earl Winterton): The Lord President is well aware of the fact that the discovery of new chemical compounds of certain kinds, particularly those which can be used in the treatment of some tropical and other diseases, at present depends largely on research work undertaken by industrial concerns in Germany, with the consequence that supplies of these new substances can for a longer or shorter period be obtained only from abroad. It is for this reason that the Government have approved the proposal of the Medical Research Council for expenditure at the rate of £30,000 per annum on research in chemotherapy, to enable this country to play a greater part in future in making new discoveries in this field. The object and nature of the new scheme were explained in the "Report of the Medical Research Council for the Year 1936-1937," which was laid before Parliament in February of this year. (Cmd. 5671.)

Mr. Adams: Is the Minister satisfied with this small sum of £30,000 a year? Is it at all equal to the requirements of the situation?

Earl Winterton: Since questions were asked on this subject a week ago I went into the matter very carefully with the Lord President's Department and the Medical Research Council, and the answer to the hon. Gentleman's question is that there are other grants in connection with this research, in addition to this new sum of money, which will, for the first two years, be expended largely in making new premises for the Council. The result will be greatly to enlarge the field of research.

Mr. Adams: Do I understand that the Government are satisfied that enough is being done?

Earl Winterton: I am concerned only with the particular question of research. Questions of supply should be addressed to the Board of Trade. In this question of research I am satisfied, and so is the Lord President's Department, that, for the moment, sufficient is being done. The matter can be reviewed at some future date.

. . . . . .

Slaughter of Animals

Mr. Liddall asked the Minister of Health whether he is aware that the deputy town clerk of the New Mills Urban District Council has informed the Stockport and District Master Butchers' Association that, although the Council are aware that 76 sheep and lambs were slaughtered on a farm in the Council's area in a period of twelve months, they are unable to take any action in the direction of requiring that such slaughter shall take place only in a registered or licensed slaughtehouse; and whether he will take steps, either by the issue of new regulations or by an amendment of the law, to prevent the slaughter of animals taking place in future under such conditions?

Mr. Elliot: A place may not be used for the slaughter of animals for human consumption unless it is registered or licensed, but I am advised that this must be construed as referring to some regular user. I will make inquiries with regard to the particular case referred to by my hon. Friend and communicate with him later.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

June 8th.—Meeting of the Editorial Committee, N.V.M.A., at 36, Gordon Square, W.C.1, 4 p.m.

June 9th.—Meeting of the Lincolnshire and District Division, N.V.M.A., at Peterborough, 2.30 p.m.

June 9th & 10th.—D.V.S.M. written examination.

June 10th.—Summer Meeting of the Southern Counties Division, N.V.M.A., at Blandford, 3 p.m.

June 13th.—D.V.S.M. oral examinations begin.

June 15th.—Meeting of the Western Counties Division, N.V.M.A., at Launceston, 2 p.m.

June 17th.—General and Annual Summer Meeting of the Lancashire Division, N.V.M.A., at Southport, 12.30 p.m.

June 22nd & 23rd.—R.C.V.S. Committee Meetings.

June 24th.—R.C.V.S. Committee and Council Meetings.

June 30th & July 1st.—R.C.V.S. written examinations.

Aug. 21st-25th.—Thirteenth International Veterinary Congress, Zürich.

Aug. 26th-27th.—Thirteenth International Veterinary Congress, Interlaken.

Sept. 5th-9th.—Annual Congress, N.V.M.A., at Glasgow.

R.C.V.S. COUNCIL ELECTION RESULT

The following result of the Royal College of Veterinary Surgeons Council Election was declared at the Annual Meeting of the Royal College, held at 10, Red Lion Square, London, W.C.1, on Thursday last.

Name	*Votes*
T. Dalling	784
H. W. Dawes	776
G. H. Livesey	744
G. K. Walker	728
W. S. Mulvey	657
A. MacKenzie	628
T. Wilson	597
J. W. Brittlebank	591
J. W. Procter	572
R. E. Glover	555

(The above-named were elected.)

W. R. Wooldridge	545
J. C. Coleman	540
T. Hare	491

. . . . .

Representation of Eire

It was also announced that Mr. A. A. Donnelly, of Drogheda, had been returned as the representative of Eire.

* * * * *

PERSONAL

Will.—Pollard, Mr. John, M.R.C.V.S., of Halifax (net personalty £9,541), £10,147.

* * * * *

INTERNATIONAL VETERINARY CONGRESS

In connection with the suggested itinerary published on page 630 of our issue of May 21st, we are asked by Mr. F. H. Robinson of the American Express Company to announce that this itinerary includes first class accommodation on all steamers, including those on the Rhine.

* * * * *

A SOUTH AFRICAN APPOINTMENT

In our issue of April 16th, page 477, we published a letter from the Hon. Secretary-Treasurer of the South African Veterinary Medical Association bringing to notice the fact that members of that Association had been advised not to apply for the post of Assistant Veterinary Officer, Basutoland Protectorate, in view of the inadequacy of the salary offered.

We now understand that as a result of the support given by the N.V.M.A. and the Associations in the African Colonies the South African Veterinary Medical Association has been successful in obtaining an appreciably better salary scale for this post and that its previous objections have thereby been removed.

A further circular has accordingly been sent to all members of that Association to the following effect:—

South African Veterinary Medical Association

P.O. Onderstepoort,
May 17th, 1938.

To All Members.

Assistant Veterinary Officer, Basutoland.

With reference to my circular of March 1st, 1938, members are advised that the scale pertaining to the above post has now been raised to £500 x 20–700.

The post carries the following privileges.

(1) Free bachelor quarters or an allowance in lieu thereof. In the case of married officers quarters will be provided when the officer is appointed to the fixed establishment, or if Government quarters are not available an allowance in lieu thereof will be granted, quarters for pensionable purposes will be valued at 1/6 of the officer's salary.

(2) Free medical attendance (other than specialist treatment).

(3) The officer makes no contribution to the Pension Fund.

The probationary period is two years, but may be shortened or lengthened. This, however, does not affect the position of an applicant who is already in the Union Service, as he would be transferred as a pensionable officer.

A language qualification is desirable, but a period longer than six months in which to pass the examination is allowed if required.

Candidates should be under 35 years of age and must produce a certificate of health before assuming duty.

Prospective applicants should communicate with the Government Secretary, Maseru, in order to secure the necessary application forms which should be completed and returned to the Government Secretary on or before June 15th, 1938.

S. W. J. van Rensburg,
Hon. Secretary-Treasurer, S.A.V.M.A.

* * * * *

LEGAL NOTES

Working a Lame Horse.—In a case recently heard at the South Western Police Court, Robert Holt (37), a carman, 1, Hannell Road, Fulham, was charged with working a lame horse at Doddington Road, Battersea, and Thomas Edward Culff (45), horsekeeper, 93, Brady Street Buildings, Whitechapel, was charged with causing the animal to be worked.

A police constable spoke to seeing Holt in charge of a coal trolley drawn by a pair of horses at Doddington Road. One of the animals was lame on both fore-limbs. Holt said, "It has not been out for two days." That morning, he saw Culff who said he was responsible for the horse being out.

Mr. Herbert C. King, veterinary surgeon, said the horse was in excellent bodily condition. It was, however, lame on both forelegs and would work in pain. The condition was due to strained tendons. The animal required rest and treatment.

The defendant Holt stated that the horse had not been working for two or three days and it seemed all right when he first brought it out.

Culff, who accepted responsibility for the horse, said that Holt was a reliable man: he would not have taken it out if he had known it was lame.

Mr. W. S. King, veterinary surgeon for the owners, said he thought the horse got worse after being taken out. It would now be given four months rest.

The magistrate dismissed the charges under the Probation of Offenders Act and directed Culff to pay three guineas costs.

* * * * *

Diseased Meat.—R. Steel, a Beccles, Suffolk, dealer was, at Clerkenwell Police Court on May 16th, fined £25 and 15 guineas costs, in all, on summonses for exposing for sale, depositing for the purpose of sale or the preparation of sale, at an address at Cowcross Street, Finsbury, meat that was diseased.

* * * * *

MEDICAL EDUCATION AND REGISTRATION

Addressing the one hundred and forty-seventh session of the General Council of Medical Education and Registration of the United Kingdom, the President, Sir Norman Walker, stated that the Council had been asked by the Home Office to give such publicity as they could to the importance of doctors taking every precaution to ensure the safe custody of dangerous drugs and other poisons.

In 1937 the names of 2,214 persons were added to the Register. The total number removed, chiefly by death, was 1,090. The Register for the present year, therefore, contained 60,163 names—1,153 more than last year and the largest number ever reached.

There was evidence that the licensing bodies in general approved of the proposal (set out in recent reports of the Curriculum and Education Committees) that the medical curriculum proper should be not less than five years. There was a general acceptance of the conviction that the vacations should be shortened and that the time thus saved should be devoted to clinical work.

* * * * *

ACCREDITED LICENCES

"It is a fair speculation that the new Milk Bill, when it does come, will provide for the State Veterinary Service taking over the granting of accredited licences from local authorities," says the *Farmers' Weekly*. "There has in the past been a good deal of heart-burning among producers about the ease or difficulty of obtaining licences in different counties. For instance, Hampshire has 533 accredited licences out of 2,645 registered producers, Wiltshire 664 out of 3,392, Cheshire has 2,725 out of 6,186, and Yorkshire (W.R.) 734 out of 7,696. It would be interesting to see how, if at all, a central authority would revise these figures."

* * * * *

SALE OF REACTORS

Devon Diseases of Animal Sub-committee, at a recent meeting, decided to call the attention of the Ministry of Agriculture to the sale of cattle affected by tuberculosis.

Mr. F. W. Verney said there was a feeling of great disquiet among many people that cows which had reacted to the tuberculin test and had been rejected from herds were being sold in the open market. There was no legislation to prevent that from taking place.

Mr. W. Harris said the disease would be stamped out more quickly if all reactors were destroyed.

Mr. W. Maddicott stated that it had been estimated that if all cattle were tested, 40 per cent. would fail. If the Government were to pay compensation, the bill would be so large that they would not be able to find the money to meet it. If animals did not pass the test, however, it did not follow that they would give "tuberculous milk."

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

* * * * *

THE ADRIAN JONES STATUE APPEAL FUND

Second Appeal

To the Editor of the Veterinary Record

Sir,—Since our first appeal, which was issued in the *Veterinary Record* of June 19th, 1937, the sum of £764 18s. 0d. has been subscribed and there will be found below a list of those who have generously supported the appeal.

Of this amount, £245 0s. 0d. has been expended in the removal of the statue from the Crystal Palace to the late Captain Adrian Jones' studio at Chelsea, the employment of a skilled sculptor to repair the damage caused by the fire and the subsequent cutting up in preparation for the casting in bronze, together with sundry small expenses.

This now leaves a balance in hand of £519 18s. 0d. to meet the expenditure of £1,083 0s. 0d. required to cover the cost of casting and the erection of the statue in, we hope, a suitable position in the grounds of the Royal Veterinary College at Camden Town.

Since the publication of our first appeal, however, to our deep sorrow and that of all British veterinarians, Captain Adrian Jones has passed away. The statue has, therefore, assumed even greater importance than heretofore, for not only is it the wish of the committee that this masterpiece should remain as a permanent record of Adrian Jones' artistic skill but also that it should be a memorial to one who was unique in the history of the profession. Few other members have earned such a reputation as the late Adrian Jones, for his skill as a veterinary surgeon was in his day recognised and held in high esteem but in addition he was able to rise to heights of international fame as an artist sculptor.

It will be seen from a perusual of the list of subscribers that members of the veterinary profession have not supported the Fund to the extent expected and this second appeal is issued in the belief that the lack of support received in the past is due more to oversight than to a disinclination to subscribe to what is felt to be a most deserving cause.

It is confidently hoped, therefore, that in the near future it will be possible, as a result of a magnificent response by the profession, to proceed with the work of casting which at the moment is held up.

Cheques should be made payable to "The Adrian Jones Statue Appeal Fund," and addressed to the Hon. Treasurer, Lieut.-Colonel P. J. Simpson, Knowle Croft, Maidenhead, Berks.

Signed E. Brayley Reynolds,
P. J. Simpson,
G. W. Dunkin.

. . . . .

The Adrian Jones Statue Appeal Fund

List of Donors to May 2nd, 1938

	£	s.	d.
Anonymous	500	0	0
Lord Derby, K.G.	100	0	0
J. V. Rank, Esq.	50	0	0
Lord Glanely	21	0	0
Edmund Esmond, Esq.	20	0	0
Captain Brayley Reynolds, O.B.E. ...	10	10	0
Lieut.-Colonel S. L. Slocock, M.C. ...	5	5	0
Major A. A. Pryer, D.S.O.	5	5	0
Society of Veterinary Officers ...	5	5	0
"Anon."	5	0	0
Mrs. Sym	5	0	0
H. E. Hornby, Esq., O.B.E.	5	0	0
Sir Frederick Hobday, C.M.G.	3	3	0
Lincolnshire and District Veterinary Association	2	12	6
G. Rocker, Esq.	2	2	0
T. Hogg, Esq.	2	2	0
D. E. Wilkinson (The late)	1	1	0
Colonel Sir A. Olver, C.B., C.M.G. ...	1	1	0
L. C. Tipper, Esq., ...	1	1	0
F. Ware, Esq., C.I.E.	1	1	0
Captain F. C. Scott	1	1	0
J. R. Baxter, Esq.	1	1	0
H. P. Hogben, Esq.	1	1	0
Professor J. G. Wright	1	1	0
L. F. Howse, Esq.	1	1	0
J. Pickup, Esq.	1	1	0
H. H. Leach, Esq.	1	1	0
G. H. Leader, Esq.	1	1	0
Major W. S. Stevens	1	1	0
Miss Bisset	1	0	0
Captain G. Sutton	1	0	0
F. T. Day, Esq.	1	0	0
Major H. E. Keylock	1	0	0
Major W. A. MacGregor	1	0	0
Captain E. F. Angler	1	0	0
J. J. Parkinson, Esq.	1	0	0
J. J. Cosgrove, Esq.	1	0	0
Captain E. E. Jelbart, M.C.	0	10	6
Colonel H. Greenfield, O.B.E.	0	10	0
	£764	18	0

CONFLICTING VETERINARY EVIDENCE

To the Editor of the Veterinary Record

Sir,—In the keen discussion that followed the interesting paper read by Mr. E. W. Little, in Dublin, as reported in your issue of April 16th, some speakers spoke with evident sincerity and anxiety on that old vexed question of conflicting evidence in the Courts. The President, Professor Browne, gave the counsel of perfection which rolls so smoothly from academic lips to the effect that the veterinary surgeon should be in no sense an advocate for the side that calls him. Mr. Donelly tried to show how, in cases of lameness particularly, honest differences of opinion might arise from lack of exact knowledge as to the seat or cause of the alleged pain and urged the more frequent use of local anaesthesia to resolve that doubt. Another speaker with evident experience and much truth reminded him that local anaesthesia for technical reasons was not an infallible guide in these matters.

As one who endured several unpleasant years of giving evidence nearly every week and sometimes every day in cruelty cases I affirm that it is humanly impossible to avoid giving the impression of conflicting veterinary evidence under existing conditions in a large proportion of the cases. The first and perhaps the main cause is our lack of exact knowledge. In cases of alleged lameness, especially, it is rare to find two veterinarians in or out of Court who can agree exactly about lameness, its nature, cause, duration, degree of pain and many other details. That is simply because most of us do not know, and none of us knows it all. Those of us who have the most experience, if we have also common sense, are, in our inmost minds, the least cocksure in such matters.

I have been studying and trying to treat lameness in horses, both my own and those of the State and of private individuals, for the best part of 40 years but now when I am confronted with a lame horse I cannot often give an opinion that is true in all respects at the first time of asking. I should certainly not attempt finality on such a point at the first examination of a horse of my own.

How is it possible then, in most instances, for the average veterinary graduate of the mechanical age to give the Court a complete account of a case of lameness after seeing the animal just out of work for the first time on a warm day for a few minutes? One specifies a "warm day" because one of the best aids to the diagnosis of lameness is to see the horse after a night's rest in the chill air of a winter's morning when local inflammation is revealed by the relative heat of the part. No one can say for certain as regards many cases of slight chronic lameness whether such lameness is evidence that the animal is suffering pain, or evidence that the animal has learned how to modify its gait so as to avoid pain. Give the animal the benefit of the doubt but agree that there is a very real doubt and abate your thirst for punishment accordingly.

We must all agree in principle that the veterinary surgeon should be in no sense an advocate, but it is too much to expect a man with red blood in his veins to go into the box and content himself with a bald account of the pathology of the case when he knows that unless he can refute the errors or exaggerations that have been made on the other side his client or friend must unjustly lose his case.

A veterinary surgeon must sometimes partly assume the rôle of advocate in the interests of justice simply because it is rare to find an advocate in city practice who can lead evidence properly in veterinary cases.

On one occasion when I was giving evidence for the prosecution, the Court allowed the veterinary surgeon for the defence to cross-examine me on my evidence and I welcomed the procedure in the aid of justice because the advocate for the defence was making things far worse for his client by his ignorance. We also have to consider the impecunious client who cannot afford legal representation and is too ignorant to do his case justice.

In "cruelty" cases, the man of experience—from the point of view of winning legal victories—is often at a disadvantage with the man who has less experience of the hard facts of the world: that is, if he is honest. For instance, it was often difficult for me to say the words that would send a poor little costermonger or cartage contractor to jail when I knew full well that many a lamer horse was being hunted or raced by so-called gentlemen that very day, and that a careful examination of almost any large stable, including those of the State, would show worse cases than that before the Court.

On more than one occasion I felt morally bound to pay a fine of many pounds rather than that a poor man should go to prison for doing what I and my sporting friends had often done, namely, taken a slight chance in working a horse that had pulled out a little lame. In a humanitarian *cause célèbre* in East London I was the chief veterinary witness called by an animal defence society against an American Rodeo company who were prosecuted for sawing off the horns of a bullock without anaesthesia. The animal had sustained a broken horn and the American in charge did what nearly every American or Canadian prairie farmer would have done in similar circumstances, namely, dishorned it. He did this in the usual rough prairie fashion, that is, he sawed off both horns near the skull and put some Stockholm tar on the bleeding stumps.

To the rodeo people the suggestion of gross cruelty as regards what they knew as a commonplace of farm life seemed ridiculous, but the London humanitarians called it a diabolical crime and I was obviously expected to rub it in hard in my evidence so that the accused might go to prison, and thus increase the enemies of Britain. I knew that in Canada such a case could not even be brought into Court, but I also knew that acute unnecessary pain had been caused and I did my best for my clients who got a conviction and a fine of £20, which was sufficient in the circumstances—but the Secretary of the animal defence society told me frankly that my evidence was not strong enough.

Experience and a reasonable disposition, indeed, may lose one a good cash client and this reflection brings us naturally to the question of money as a factor in conflicting expert evidence. It is proverbially true that he who pays the piper may call the tune, and in Court cases, as elsewhere in this imperfect world, money talks with no uncertain voice. Giving expert evidence in Court is often an easy, well paid, though insecure job, especially for the veterinary surgeon for the prosecution, and veterinary surgeons, like the rest of the community, would rather keep such a job, as a rule, than lose it. And jobs are mostly kept in private life by pleasing employers. Similarly, the veterinary surgeon for the defence may, and often does, find that the outcome of a "cruelty" case makes all the difference between keeping or losing or at least risking the loss of a good client. Moreover, the client may be, and often is, also a friend for whom he feels in friendship bound to do his best apart from the question of money.

Thus, if we are honest with ourselves, we must conclude that for several obvious reasons we cannot, under existing conditions, always give our evidence in the ideally impartial way we should all desire. If and when veterinary surgeons are employed in Court cases in an honorary capacity or are given absolute security of tenure as expert advisers of the Court with adequate settled salaries we may attain to that sublime height imagined by Professor Browne.

We have no veterinary post comparable with that held by that admirable medical expert witness Sir Bernard Spilsbury, whose position is or was as safe as that of the Judge himself. And perhaps we never shall have, because even Sir Bernard's justified assurance on pathological questions might quail before the ordeal of lightning diagnosis and prognosis in assorted cases of equine lameness in the rough and unready atmosphere of a police court yard. Nevertheless, until the veterinary profession can secure expert witness posts comparable in security and emoluments with that of the expert witness mentioned, it is scarcely true to talk of our not being to some extent advocates for the side that pays us or that is bound to us by ties of friendship or compassion.

In the meantime we with experience know that veterinary academicians, as well as practitioners and bureaucrats, share the common weakness in being subject to such mundane, human, and sometimes sordid influences as money, office, professional jealousy, compassion, friendship and sheer ignorance, and that their evidence is often coloured accordingly. Conflicting evidence, whether it be veterinary, medical, legal, political, or merely amorous, is but one of the many things that cannot easily be righted in a world which—in so many respects—is basically wrong.

Yours faithfully,

WAKEFIELD RAINEY.

Blomfontein Turf Club,
South Africa.

May 16th, 1938.

* * * * *

THE MINISTRY'S PANELS

TO THE EDITOR OF THE VETERINARY RECORD

Sir,—As there appears to be endless trouble and great upset in regard to the Panels which have been allotted throughout the country, may I be allowed to make the following suggestions?

(1) Any inspection which the Ministry staff cannot cope with ought to be evenly distributed and not given to a few of the selected, *viz.*, Panel A inspectors, and in those cases decision as to the person to be employed should rest with the farmer.

(2) Where the Ministry staff cannot inspect markets then in those cases, decision should rest with the local authority. I have lost two markets

which have been given to my opposition veterinary surgeon who lives six miles away and who is not a ratepayer in the town.

The manner in which this allocation has been done is a scandal. We are all taxpayers and therefore entitled to our proper proportion of the work which this supposed National Scheme produces: it should not all be given to a few to the detriment of the others.

Out of four veterinary practitioners in this area I am the only one who is not on Panel A, with the result that I have lost two markets and my Grade A farms are being inspected by my neighbours.

If by chance the whole country is divided similarly to this area and only one out of four is on Panel B, then the prospects of an alteration in the system will be very remote because I cannot imagine Panel A inspectors wanting it worked by any other method as they would then be the losers.

This monopoly, more than anything else, will prevent the younger generation from going into practice. The country veterinary surgeon will soon be as scarce as the blacksmith and the farmer will suffer in consequence. How can you expect young practitioners to go there when they know that although old so and so is worn out and it is time a younger man started, he has the inspectorship of that district?

It would, Mr. Editor, be most interesting if you could publish the exact number of veterinary surgeons on Panel A and the number on Panel B, then we could easily form an opinion as to whether the battle is worth fighting or not.

Yours faithfully,

G. C. Lancaster.

Eastwick House,
Evesham,
Worcs.
May 23rd, 1938.

METHODS OF TUBERCULIN TESTING

Are We Slow in the Uptake?

To the Editor of the Veterinary Record

Sir,—Mr. Edward F. Peck's letter and his queries are interesting and furnish food for thought. It is only a few years ago since Great Britain adopted the intradermal test for tuberculosis and then only after much controversy. Professor J. B. Buxton, F.R.C.V.S., put the operation on a sound footing in this country and the late Mr. Robin Catmur helped the practitioner in the technical detail of the procedure and showed the usefulness of the dental syringe in carrying out the test. And yet the intradermal test had already been carried out in Canada for several years with confidence and success previous to its introduction here.

There have been one or two practitioners in this country who have expressed a preference for the caudal fold injection, but the procedure has not been generally adopted.

With the example before us as given by Mr. Peck and the reasons he gives us for its adoption, the matter ought to be seriously taken up. In its saving of time, lessening of expense and increase in convenience for the practitioner there seems much to recommend the caudal fold injection.

Yours sincerely,

G. Mayall, M.R.C.V.S.

Bolton.
May 28th, 1938.

Erratum.—In our issue of April 16th, 1938 (p. 468) we published an abstract of an article by Marcenac, "Experience with Chloral Narcosis in Horses." We regret that an error was made in giving the dosage, which is given in grammes per kg. body weight: this should read grammes per 100 kg. body weight.

Diseases of Animals Acts

SUMMARY OF RETURNS

Period.	Anthrax.		Foot-and-Mouth Disease.		Parasitic§ Mange.		Sheep Scab.	Swine Fever.	
	Outbreaks confirmed.	Animals attacked.	Outbreaks confirmed.	Animals slaughtered as diseased or exposed to infection.	Outbreaks reported by the Local Authorities.	Animals attacked.	Outbreaks confirmed.	Outbreaks confirmed.	Swine slaughtered.
	No.	No.	No.	No.	No.	No.	No.	No.	No.
Period 1st to 15th May, 1938	37	50	3	276	1	2	6	40	12
Corresponding period in									
1937	31	34	—	—	4	5	3	51	43
1936	15	16	—	—	2	5	6	94	71
1935	14	15	2	1,242	3	5	5	85	54
Total 1st January to 15th May, 1938	393	425	151	19,097	41	65	96	180	86
Corresponding period in									
1937	299	336	3	262	72	108	114	449	272
1936	213	255	4	379	65	197	132	840	576
1935	167	183	32	10,111	62	93	176	663	315

Note.—The figures for the current year are approximate only.

§ Excluding outbreaks in Army Horses.